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# An Economic Analysis of Generic Fluid Milk Advertising in Ontario, Quebec, the Maritime Provinces

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- Enhance both public and private policy maker's understanding of the economics of commodity promotion programs.
- Facilitate the development of new theory and research methodology.

# An Economic Analysis of Generic Fluid Milk Advertising in Ontario, Quebec, and the Maritime Provinces

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## KEY RESULTS

- Generic fluid milk advertising in the Maritime provinces, Quebec and Ontario had a positive and statistically significant impact on fluid milk demand in these regions over the period 1990 to 2004.

- Taken together, non-advertising marketing elements (such as promotion, sponsorship, nutrition communication and public relations) had a positive and statistically significant impact on fluid milk demand in Quebec and the Maritime region, but a less certain impact in Ontario in the same time period.

- The average producer rate of return to actual generic fluid milk advertising over the period 2000 to 2004 are as follows:
    - Maritime: $2.2 for every dollar invested
    - Quebec: $7.4 for every dollar invested
    - Ontario: $3.4 for every dollar invested

- Further analysis suggests that over the period 2000 to 2004, the Maritime region over-invested in generic advertising, Quebec under-invested during the same time period, while Ontario's advertising expenditures were slightly below optimal.

- During the same time period, investment in non-advertising marketing activities in all three regions was below optimal (i.e. all provinces under-invested in these activities).

- Results suggest there is room to further increase producer benefits by increasing real expenditures on generic advertising in Quebec and Ontario, and real expenditures on non-advertising activities in all three regions. At the least, the status quo level of expenditure should compensate high media cost inflation in order to maintain real expenditure.

- In Quebec, future budget increases should focus on advertising rather than on non-advertising marketing elements.

# An Economic Analysis of Generic Fluid Milk Advertising in Ontario, Quebec, and the Maritime Provinces

## Executive Summary

Over the last several decades, provincial milk boards in Canada have invested heavily in generic advertising of milk and dairy products. Such investment is undertaken with the intent of increasing consumption of milk and, given the supply management nature of milk production in Canada, raising producer revenues. Given the large amount of investment in advertising and promotion, it is important to conduct periodic economic evaluations to determine the profitability of these activities. While previous economic studies suggest that investment in generic fluid milk advertising does, indeed, generate a positive net return, there has not been an updated analysis of these activities for some time.

Accordingly, the objectives of this study are twofold. First, to provide an economic assessment of the responsiveness of fluid milk consumption to milk advertising and promotion in Ontario, Quebec, and the Maritime provinces over the last several years. Second, to broadly evaluate a possible reallocation of advertising and promotion budgets between provinces. This analysis is conducted using econometric models of provincial or regional fluid milk demand in eastern Canada. The econometric results are used to simulate the impacts of various provincial advertising and non-advertising marketing (i.e. promotion, sponsorship, nutrition communication, public relations) scenarios for these three milk markets. First, two generic advertising scenarios are simulated: (1) a baseline scenario with generic advertising expenditures equal to historical levels, and (2) a no-advertising scenario, where generic advertising expenditures are set to zero. Based on the difference between these two scenarios, an average rate of return to advertising is calculated for each of the three regions. The average rate of return is a useful figure since it measures the overall profitability of the investment. Next, we

simulate the impact of increasing advertising or non-advertising marketing expenditure by $10,000 per quarter on consumption and producer revenues to ascertain the extent to which the resulting benefits exceed the costs in each region. Based on this simulation, a marginal rate of return to advertising and non-advertising marketing elements is calculated for each region. These marginal rates of return to advertising and promotion are useful for evaluating the optimality of existing marketing campaigns.

In each market, per capita fluid milk sales are assumed to be affected not only by generic advertising and non-advertising demand enhancement expenditures (e.g., promotion, nutrition education, and sponsorships), but also by the retail price of milk, prices of substitutes for milk, consumer income, and seasonal indicator variables. While this was the initial specification used for each region, the final specification differs for each market in terms of which variables were included in the model. In addition, the dynamic effects of advertising and non-advertising marketing elements were modeled differently for each province. For example, for the Maritime region, only current advertising was included in the final specification. For Quebec, current and lagged advertising was included in the final specification. Lagged advertising captures any carry-over effect that advertising might have. Finally, in Ontario, lagged, but not current advertising was included in the model. These differences imply that the dynamic effects of advertising in each market are different, which may be related to the advertising campaign in each market and/or to differences in culture and demographics in each region.

The econometric results reveal that generic fluid milk advertising in all three markets had a positive and statistically significant impact on per capita consumption. Quebec had the highest advertising elasticity equal to 0.060, i.e., a one percent increase in advertising results in a 0.060 percent increase in per capita demand. The Maritime region had the lowest advertising elasticity of 0.014, while Ontario's equaled 0.027. A statistical test was conducted to determine whether

these advertising elasticities were statistically different from each other. The results indicated that they were statistically different in each market.

Non-advertising marketing element elasticities were also measured. In Ontario, expenditures on these non-advertising demand enhancing elements (i.e. ingredient/calendar, nutrition communication, promotion and public relations/sponsorship) were not found to have a statistically significant effect on demand for fluid milk. It should be noted, however, that the impact of these non-advertising marketing elements appears to be persistent; the dynamics for the non-advertising marketing activities are long, ranging between three and six quarters back. Moreover, it must be noted that the absence of a statistically significant relationship does not imply that no relationship exists, but that there is more uncertainty with respect to the precise size of this effect. In the Maritime region, the combination of promotion, nutritional communication, and sponsorship had a positive and marginally statistically significant impact on per capita milk demand. A one percent increase in expenditures on these activities was found to increase per capita milk demand by 0.008 percent holding all other demand factors constant. In Quebec, the combination of these activities had an elasticity value of 0.041, which was statistically significant.

A simulation model is developed for each province to simulate market conditions with and without generic milk advertising. These scenarios are used to calculate an average rate of return on investment to advertising. The average rate of return is greater than one in each region and is the highest in Quebec at 7.4, followed by Ontario at 3.4 and the Maritime region at 2.2. The average rate of return means that each dollar invested in generic advertising has generated $7.40, $3.40 and $2.20 in net returns to dairy farmers in Quebec, Ontario and the Maritime region, respectively. These results suggest that dairy farmers are benefiting from generic milk advertising in each region of eastern Canada.

We also simulate market conditions based on several scenarios involving adding $10,000 per quarter to advertising or promotion in each region in order to compute marginal rates of return. Marginal rates of return are used to determine whether more or less money should be allocated to the market. A marginal rate of return above 1.0 implies that extra money in advertising or non-advertising marketing activities would generate a return for the incremental investment that is higher than its costs, and therefore is interpreted as under-spending. On the other hand, a marginal rate of return below 1.0 implies the opposite, i.e., too much money is being spent on the activity since the incremental costs are higher than its returns.

The impact of increasing advertising spending (by $10,000 per quarter) is the greatest in Quebec, with a marginal producer rate of return of 5.04, followed by Ontario and the Maritime region with marginal producer rate of returns of 1.05 and 0.67, respectively. This implies that increasing advertising by $10,000 per quarter would result in an average increase in farm revenues of $50,400, $10,500, and $6,700 per quarter in Quebec, Ontario, and the Maritime region, respectively over this period. (Note that these calculations net out the marginal cost of production associated with producing more milk, as well as take into account a butterfat adjustment.) As for the impact of increasing expenditures on non-advertising demand enhancing activities, the impact is the greatest in Quebec, with a producer marginal rate of return of 3.95, followed by the Maritime region and Ontario with producer marginal rate of returns of 1.05 and 1.02, respectively. The latter number should be interpreted with caution because Ontario's elasticity coefficient for non-advertising activities is not statistically significant.

It is interesting to note that Ontario's marginal rate of return for advertising is close to 1.0, meaning that advertising spending in real terms in that region seems nearly optimal (slightly under-investing). In Quebec, increasing advertising would generate benefits that are significantly larger than the costs of the additional spending. Regarding the Maritime region, increasing

generic promotion would generate less net revenues than the cost of the investment. In all regions, but the Maritime region, an incremental increase in advertising spending of $10,000 per quarter generates a better return than in the other non-advertising activities. Therefore, from an optimal point of view, Quebec should devote important parts of future budget increases to advertising. Among the three regions, Quebec would clearly benefit the most from an increase in advertising and promotion. Considering that the the three regions have pooled their advertising and promotion budget, these results suggest that advertising and non-advertising spending should be increased in Quebec, maintained in real terms in Ontario, while advertising marketing expenditures spending should be reduced in real terms in the Maritime region.

## An Economic Analysis of Generic Fluid Milk Advertising in Ontario, Quebec, and the Maritime Provinces

### Introduction

Over the last several decades, provincial milk boards in Canada have invested heavily in generic advertising of milk and dairy products. Such investment is undertaken with the intent of increasing consumption of milk and, given the supply management nature of milk production in Canada, raising producer revenues. Previous studies (primarily conducted by Ellen Goddard, see for example Goddard and McCutcheon 1993) suggest that investment in generic fluid milk advertising does generate a positive net return for producers.

Within eastern Canada, Ontario, Quebec and the Maritime provinces have all used different advertising campaigns. Not only do the themes of these advertising programs differ, but so too does the mode of delivery (i.e., television, print media, etc). Following a greater integration of milk revenues in eastern Canada through milk pooling, it seems important to be able to access the marginal revenue of generic advertising, and other non-advertising elements of the marketing mix, for each of the concerned region. Moreover, the three regions have recently pooled their resources dedicated to advertising and non-advertising marketing activities, increasing the need for data that can help to improve budget reallocation in these activities among the regions.

The objectives of this study are twofold. First, to provide an economic assessment of the responsiveness of fluid milk consumption to milk advertising in Ontario, Quebec, and the Maritime provinces over the last several years. Second, to broadly evaluate a possible reallocation of advertising and non-advertising marketing budget between Quebec Ontario and the Maritime region.

This analysis is conducted using econometric models of provincial or regional fluid milk demand in eastern Canada. The econometric results are used to simulate the impacts of provincial advertising and non-advertising marketing programs on these three milk markets. Specifically, we simulate the market impacts for a scenario where there is no generic milk advertising and one based on historical levels of advertising. Based on this simulation, an average rate of return to advertising is calculated for each region. We also simulate the impact of increasing advertising or non-advertising marketing budgets by $10,000 per quarter on consumption and producer revenues to ascertain the extent to which the resulting benefits exceed the costs in each region. Based on this simulation, a marginal rate of return to each marketing activity is calculated for each region.

The following sections describe the conceptual fluid milk demand model used to evaluate advertising in the markets being analyzed, document the data collected for this analysis, discuss specific issues related to model estimation, as well as report and interpret the econometric results. Finally, the last section reports the simulation results of the provincial advertising program impacts on these three milk markets.

## The Model

In each market, per capita fluid milk sales are assumed to be affected not only by generic advertising and non-advertising demand enhancement expenditures (e.g., promotion, nutrition education, sponsorship, public relations etc.), but also by the retail price of milk, prices of substitutes for milk, consumer income, and seasonal indicator variables. The general form for the demand equation for each market can be expressed as:

Quantity = f(fluid milk price, substitute price, income, generic fluid milk advertising expenditures, generic fluid milk non-advertising demand enhancement expenditures, seasonality).

Regardless of the functional form chosen for estimation, economic theory provides a

basis for expectations as to the signs of the price and income variables. With fluid milk quantity as the dependent variable, the estimated coefficient for fluid milk price should have a negative sign. In other words, the expected consumer response to an increase in the price of milk is lower consumption. When the price of a substitute for milk rises, making milk a relatively better buy, the effect should be to increase milk consumption. Thus, the estimated coefficient for any substitute price is expected to be positive. The estimated coefficient for income is expected to have a positive sign. When income rises, consumers can be expected to purchase more milk, as well as more of most goods. If milk advertising is effective, an increase in milk advertising should be associated with greater milk consumption; thus estimated generic milk advertising coefficients should have positive signs when advertising is working as intended. Likewise, expenditures on non-advertising demand enhancing activities are expected to have a positive impact on milk consumption. The seasonal (quarterly) indicator variables will have a negative sign if milk consumption is lower in that particular quarter relative to the fourth quarter consumption, and a positive sign if milk consumption is higher in that particular quarter.

## Data

To estimate the model described above, one needs to obtain data for each of the respective regions over time. This approach allows one to capture the average relationship between quantity of fluid milk demanded and the various factors of demand. For our study, we gathered quarterly quantity, price, income, population, advertising and non-advertising marketing expenditure data. These data covered the period 1990 to 2004 for Ontario and Quebec, and 1992 to 2004 (quarter three) for the Maritime Provinces. Three sources of data were employed. Quantity data were gathered from both the Canadian Dairy Commission and Statistics Canada. Price, income, and population information were gathered from Statistics Canada and Ellen Goddard. For Quebec, the advertising and promotion expenditure data were gathered directly

from the *Fédération des producteurs de lait du Québec*. The Maritime region data used were gathered from Milk Maritimes, Dairy Farmers of Canada and Ellen Goddard's data set. Advertising and promotion expenditure data for Ontario were gathered from the Dairy Farmers of Ontario and Michael Pearce, consultant to the Dairy Farmer's of Ontario. Specific data sources and manipulations are included in Appendix 1. All of the data used in the econometric models are listed in Appendix III of this report.

By way of introduction, Figures 1 through 12 provide a graphical illustration of the key variables in the respective region's demand models (note that these data are plotted in nominal terms – no adjustment has been made for inflation). Figure 1 shows quarterly per capita fluid milk sales across the three regions from 1990 to 2004.[1] Three points emerge from this figure: 1) the Maritime region has slightly higher per capita fluid milk sales than Ontario and Quebec, 2) fluid milk sales exhibit strong seasonality, with peak (per capita) sales occurring in quarters 1 and 4 (i.e., the fall and winter) and low sales seasons occurring in quarters 2 and 3 (i.e., spring and summer), 3) per capita fluid milk sales show a declining trend in all three regions, but especially in Ontario and Quebec. Figure 2 further reinforces the first point, illustrating that per capita fluid milks sales have been higher (on average over the sample period 1990 to 2004) in the Maritime region than in Ontario and Quebec.

Figure 3 plots the quarterly values of the fluid milk consumer price indices used in this study. These series represent the price the consumer pays at the retail level, but in reference to the price paid at a specific point in time (in this case, the price indices are normalized to equal

1 Due to data limitations, the Maritime region model only includes data from 1992 quarter 4 to 2004 quarter 3. Per capita fluid milk consumption for the Maritime region is based on per capita consumption in Nova Scotia, Prince Edward Island, and New Brunswick. These data do not control for the influx of tourists in the summer time, however, the seasonal pattern in the Maritime region per capita consumption looks similar to that in Quebec and Ontario.

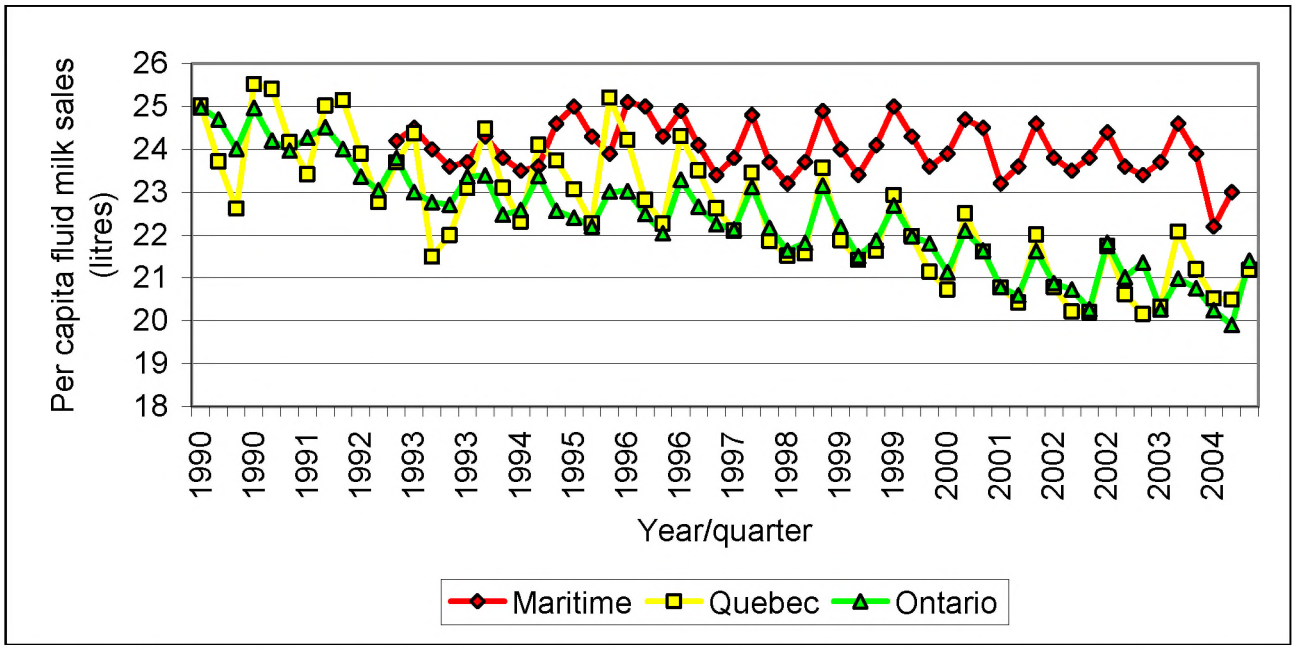


**Figure 1. Per capita fluid milk sales (in litres) in the Maritime region, Quebec and Ontario, 1990 to 2004.**

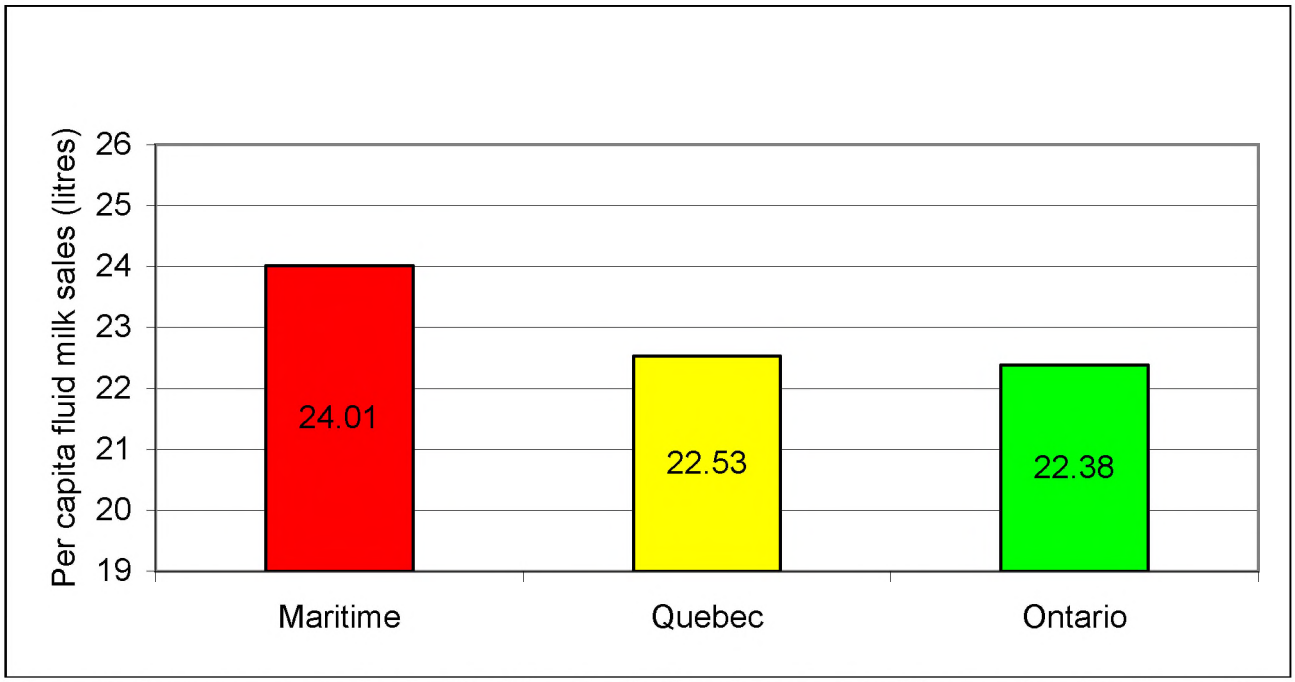


**Figure 2. Average per capita fluid milk sales (in litres) in the Maritime region, Quebec and Ontario over 1990 to 2004.**

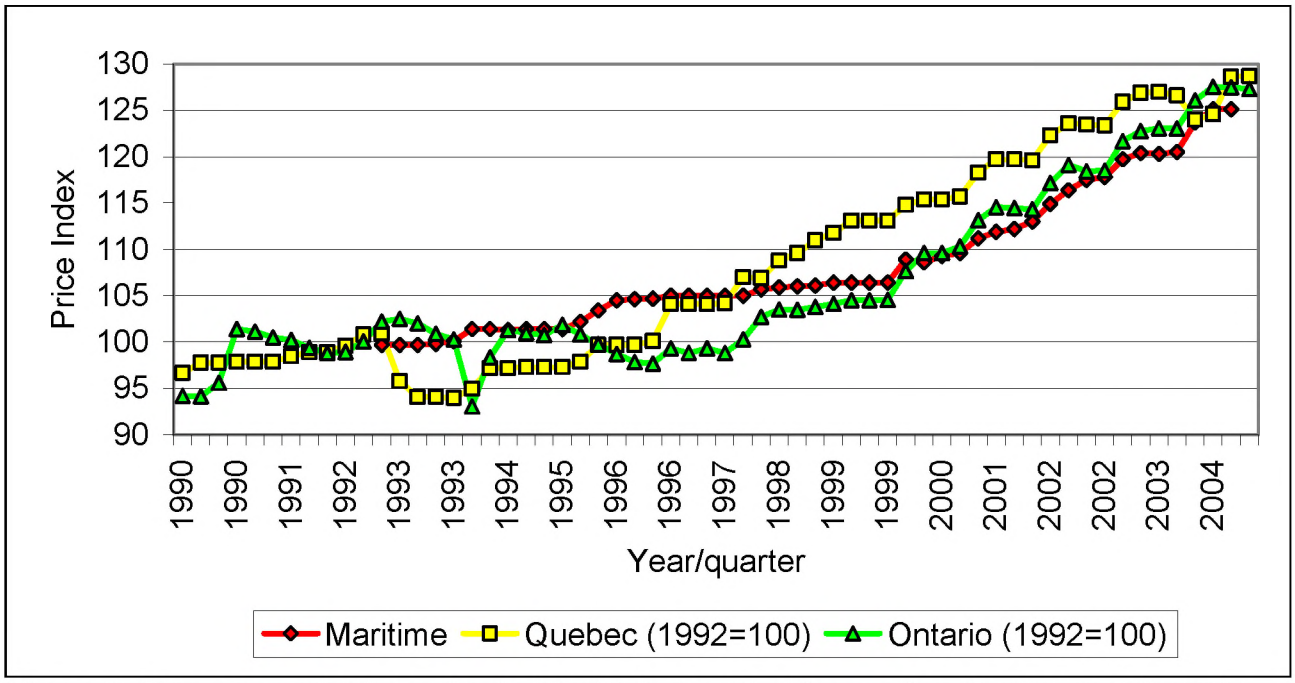


**Figure 3. Consumer price index for fluid milk in the Maritime region, Quebec and Ontario, 1990 to 2004.**

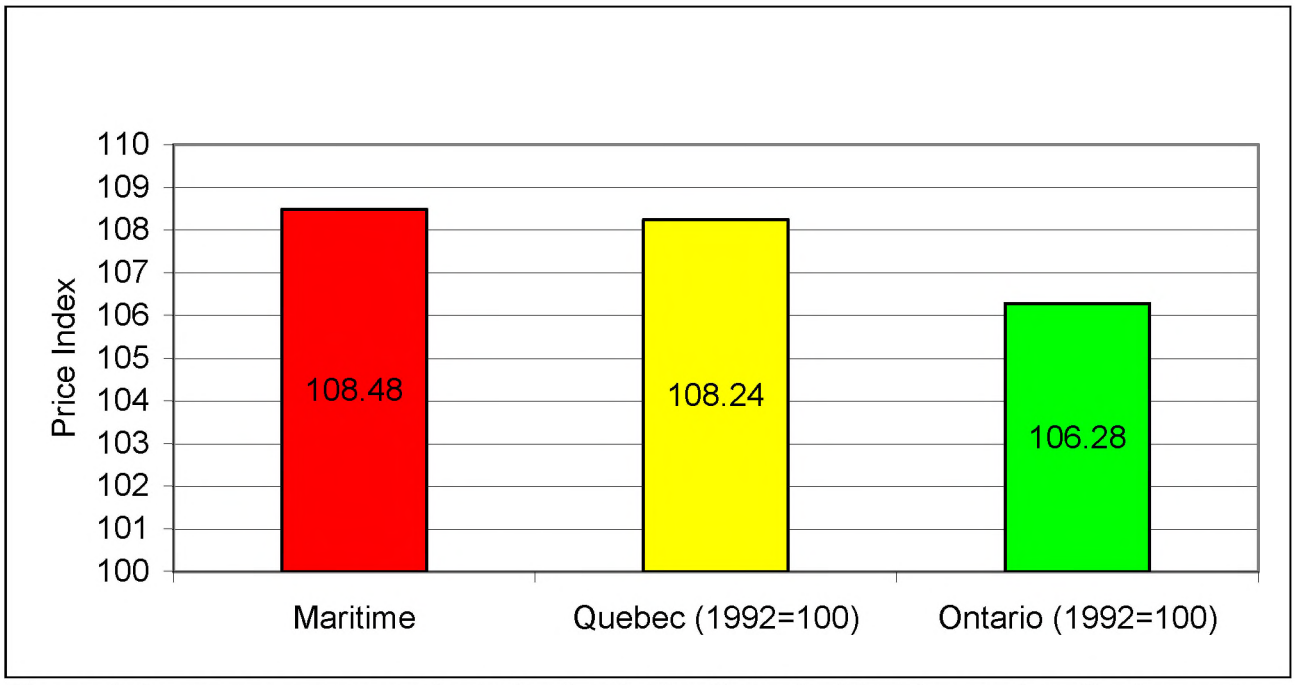


**Figure 4. Average consumer price index for fluid milk in the Maritime region, Quebec and Ontario over 1990 to 2004.**

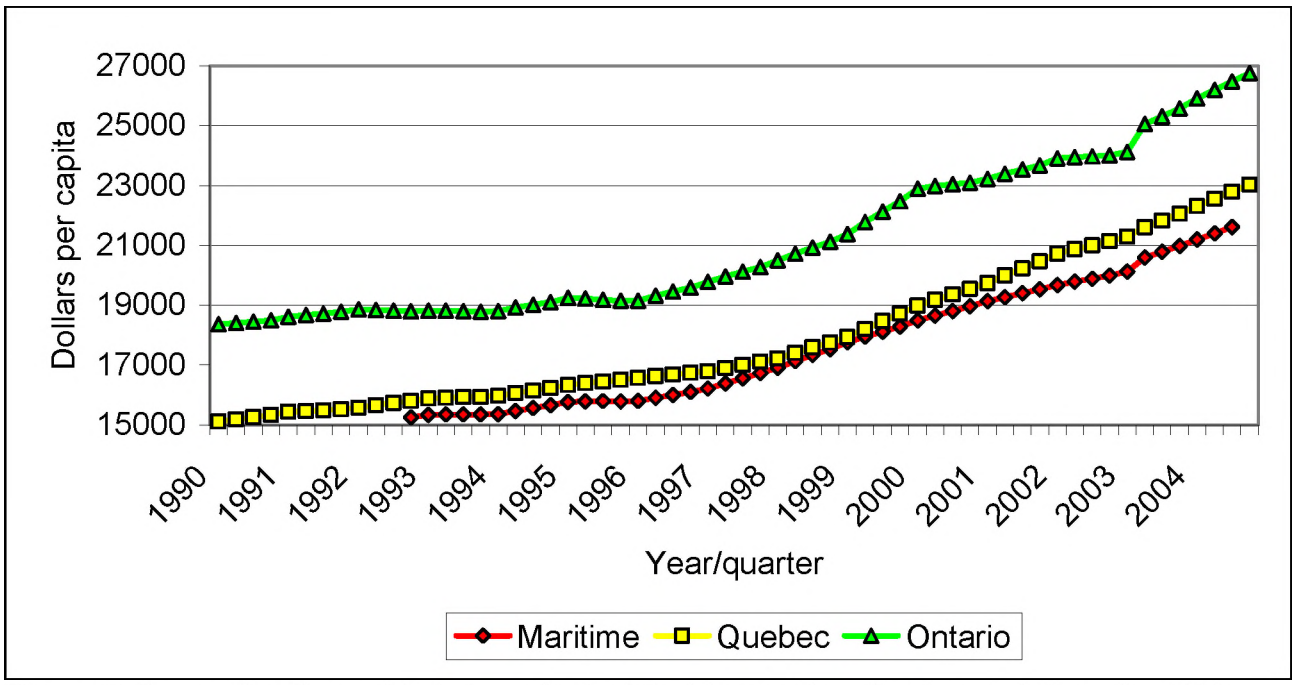


**Figure 5. Per capita disposable income in the Maritime region, Quebec and Ontario, 1990 to 2004.**

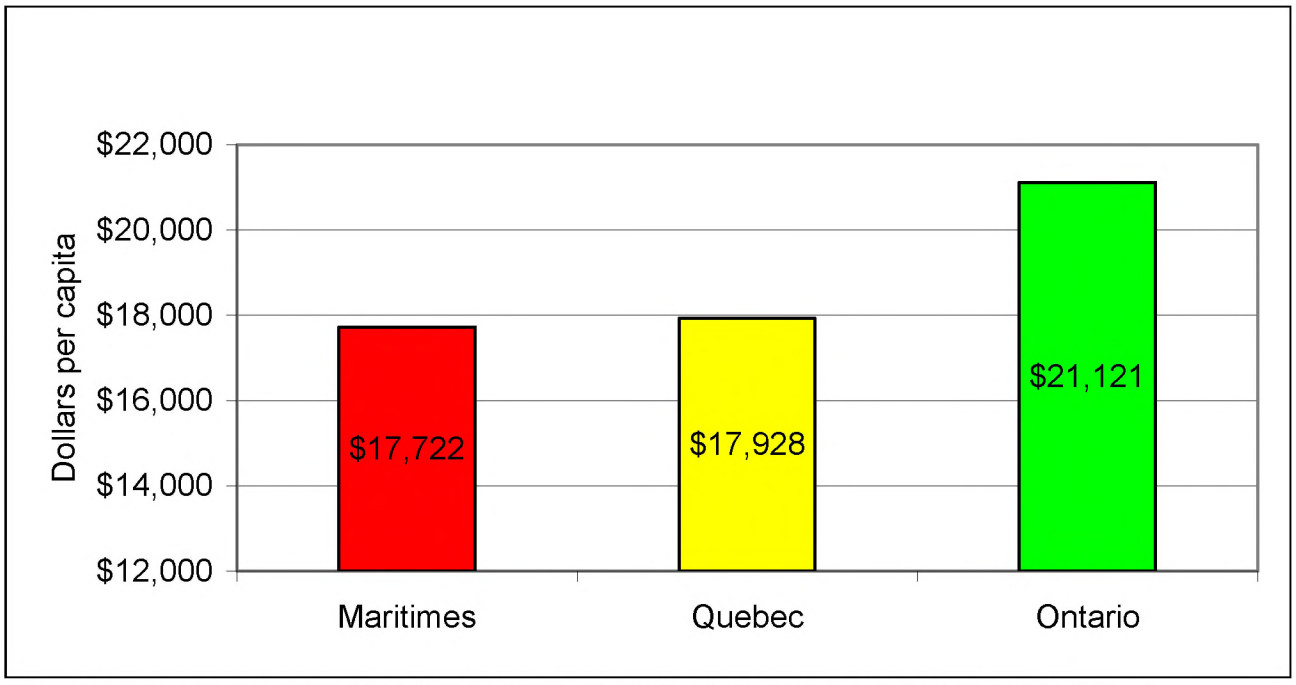


**Figure 6. Average per capita disposable income in the Maritime region, Quebec and Ontario over 1990 to 2004.**

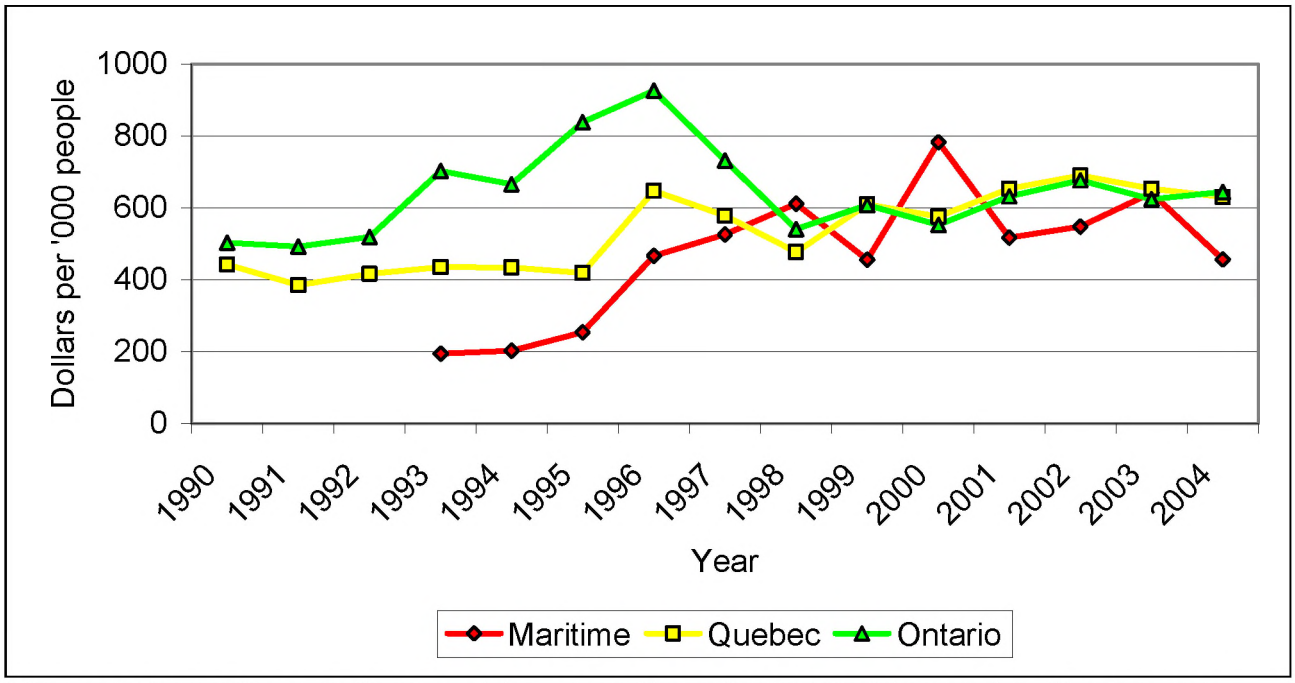


**Figure 7. Per capita generic advertising expenditure in the Maritime region, Quebec and Ontario, 1990 to 2004.**

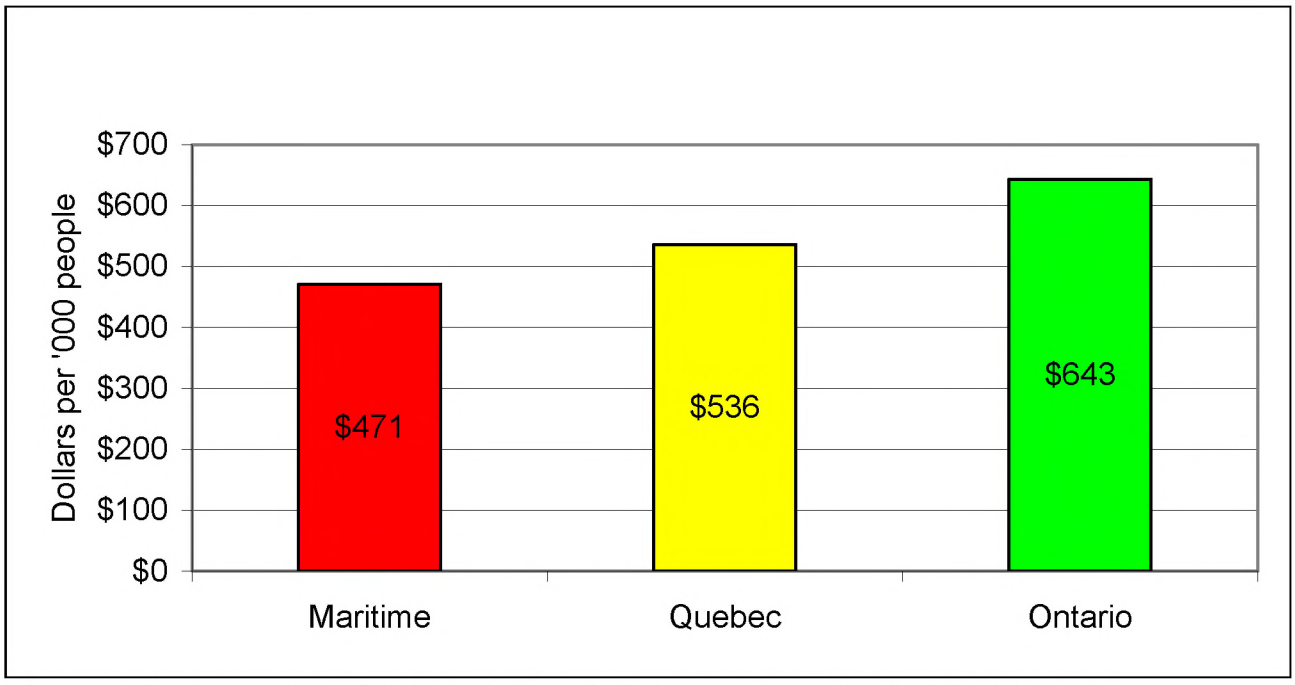


**Figure 8. Average per capita generic advertising expenditure in the Maritime region, Quebec and Ontario over 1990 to 2004.**

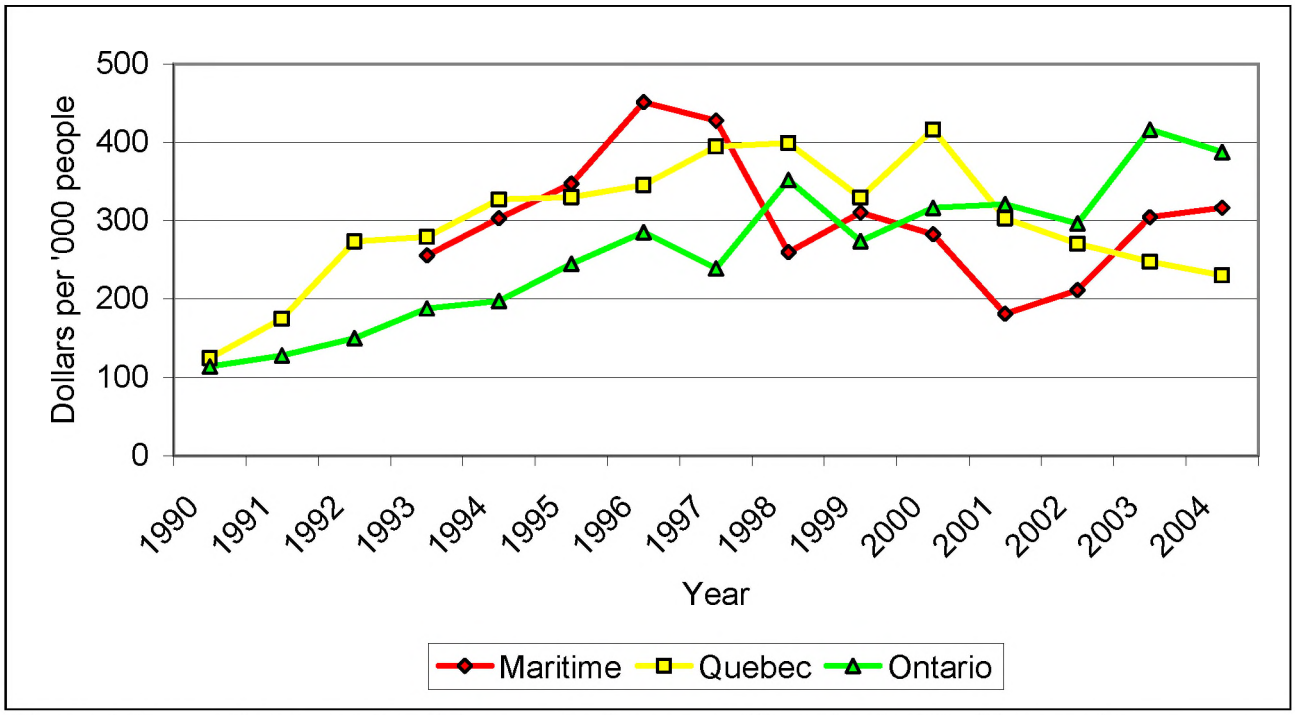


**Figure 9. Per capita non-advertising marketing expenditure in the Maritime region, Quebec and Ontario, 1990 to 2004.**

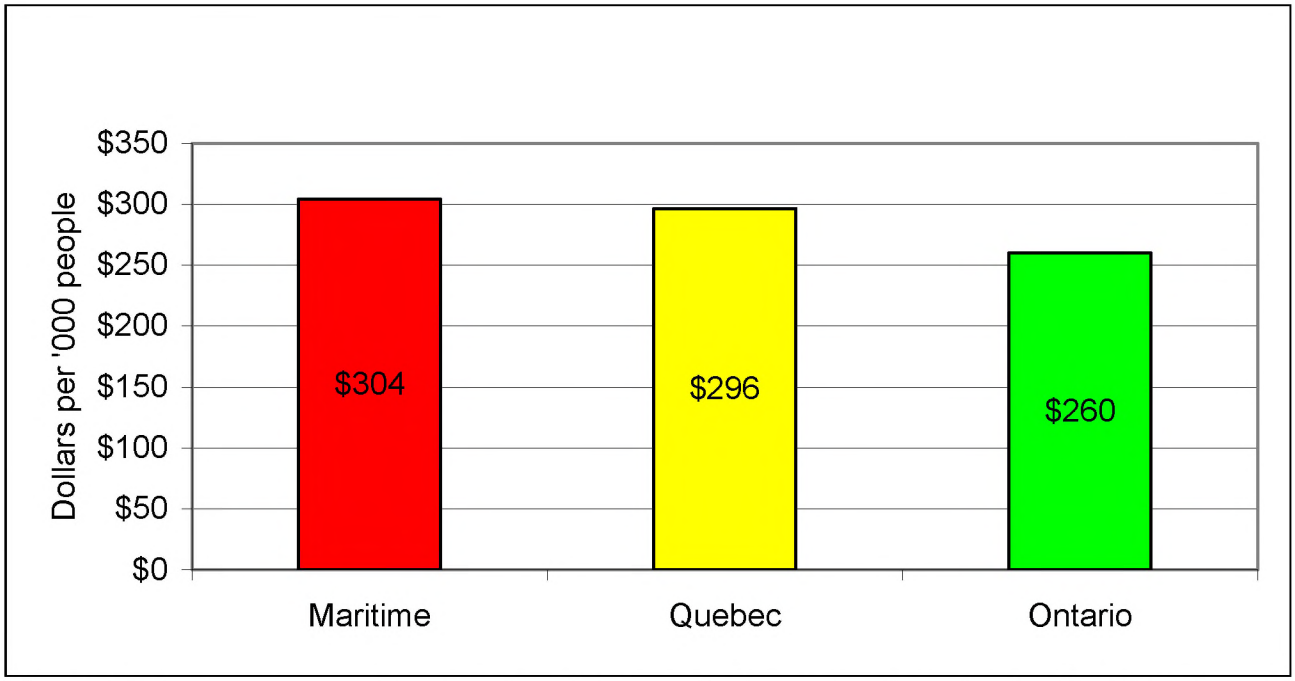


**Figure 10. Average per capita non-advertising marketing expenditure in the Maritime region, Quebec and Ontario over 1990 to 2004.**

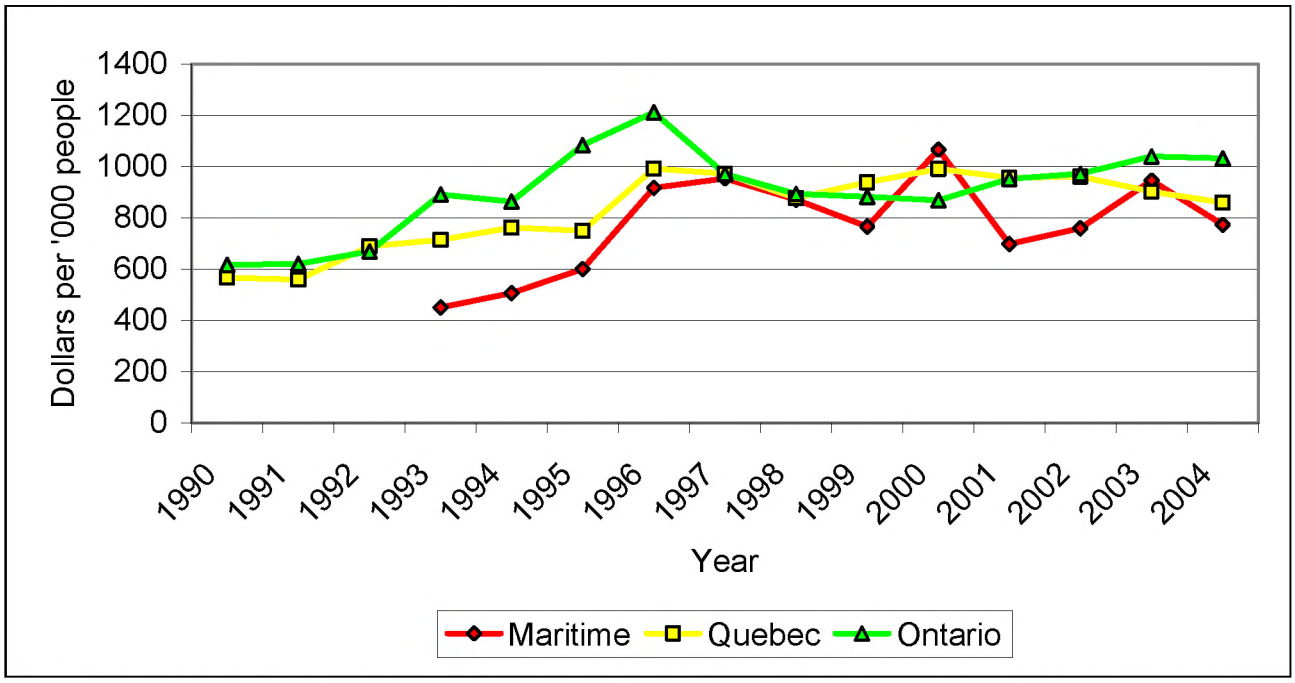


**Figure 11. Per capita marketing expenditure in the Maritime region, Quebec and Ontario, 1990 to 2004.**

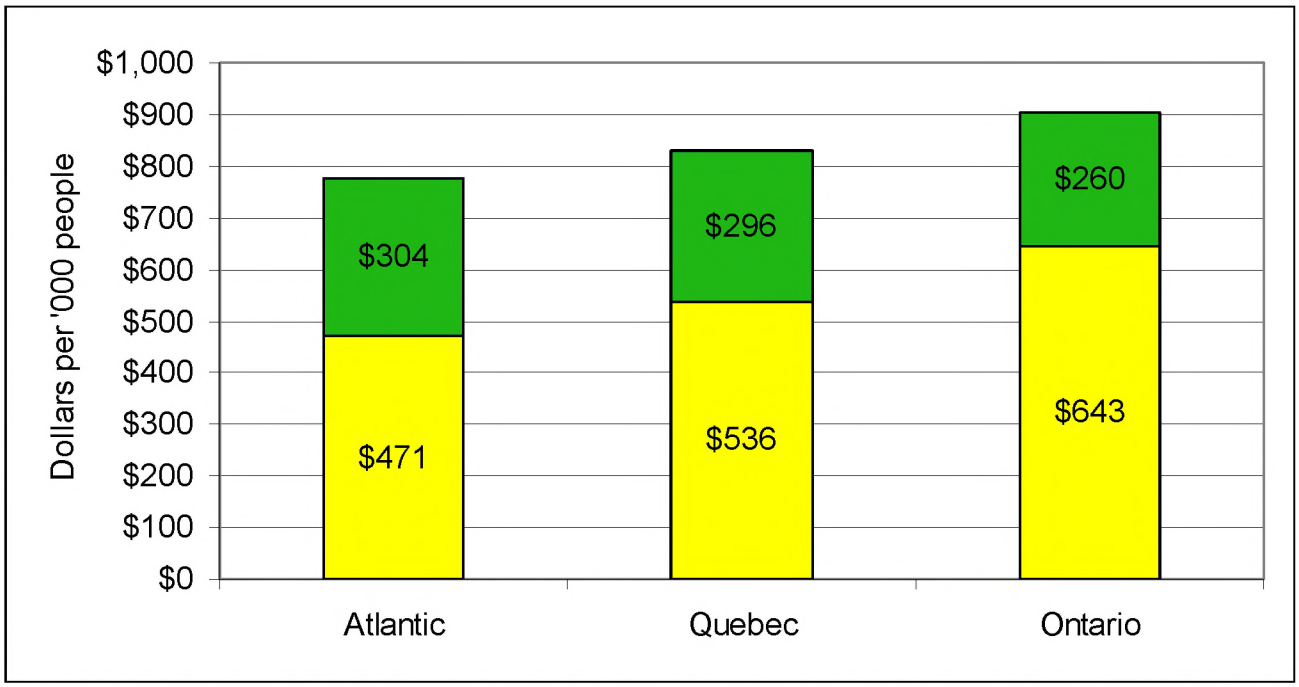


**Figure 12. Average per capita marketing expenditure in the Maritime region, Quebec and Ontario over 1990 to 2004.**

**Estimation**

100 for the calendar year 1992). The price index in all three regions trends upwards and all appear to follow a similar trend. As shown in Figure 4, however, the average value of the fluid

milk price index series is higher in the Maritime region and Quebec than in Ontario.

Figure 5 shows the quarterly values of per capita disposable income in all three regions. As evident, per capita disposable income trends upwards over time. However, as Figure 6 illustrates, the average value of per capita disposable income is higher in Ontario than in Quebec and the Maritime region, with the latter two being on par with each other.

Expenditure on generic advertising media and production activities (stated in dollars per thousand people) are plotted on an annual basis in Figure 7. This figure uses annual observations to eliminate the wide seasonal variation in these series that make it difficult to view the data in a meaningful way. Per capita generic advertising expenditure trends upwards in the Maritime region and Quebec during this time period. In Ontario, this series initially increases over time, falls in the mid to late 1990s, only to follow the same (upward) trend as Quebec from 1998 onwards. Figure 8 illustrates that, on average, Ontario has spent more per thousand people than Quebec and the Maritime region during the sample period.

Figure 9 plots per capita expenditure on non-advertising marketing activities (which includes promotion and sponsorship, nutrition communication and education, public relations and, in the case of Ontario, spending on the milk calendar and ingredient communications). While not shown, considerable seasonality is evident in these series. Nevertheless, it should be clear from Figure 9 that Ontario's per capita spending on non-advertising marketing activities has increased over the sample period. It should be noted that spending items that are classified as public relations in Ontario are classified as non-advertising marketing (i.e. promotion and sponsorship) in Quebec and the Maritime region, thus these items were already accounted for. Note that for both Quebec and the Maritime region, per capita expenditure on non-advertising marketing activities increased into the mid to late 1990s, but generally declined from the late 1990s onward. Nevertheless, Figure 10 shows that on average, per capita non-advertising

expenditure in each region are close to each other, with the Maritime region having the highest average per capita non-advertising expenditure, followed by Quebec and then Ontario.

Figure 11 plots total marketing expenditure (i.e., advertising and non-advertising expenditure) over time and in each region. In general terms, annual per capita marketing expenditure has increased in all three regions. Recall, however, that these data are provided in nominal terms, so these expenditures do not reflect the impact of media cost inflation. Lastly, Figure 12 shows average (from 1990 to 2004) per capita expenditure on advertising and non-advertising marketing activities in all three regions. Ontario has the highest per capita marketing spend ($903per thousand people), followed by Quebec ($832) and the Maritime region ($775). Note than differences in per capita advertising spending drive most of the differences in the regional marketing expenditure values.

Each of the three regions is distinctively different in terms of their culture and demographic characteristics. Therefore, it is likely that milk consuming behavior in these three markets is different as well. Consequently, rather than estimating one fluid milk demand model based on data from all three regions, we felt it would be more useful and appropriate to estimate three separate demand models for each region.

Initially, the following model was specified and estimated for each region:

$$(1)\quad \ln SALES_t = \alpha_0 + \alpha_1 \ln (PRICE_t) + \alpha_2 \ln INCOME_t + \alpha_3 \ln SUBPRICE + \alpha_4 \ln NON\text{-}MILKAD + \sum_{j=0}^{n} \omega_j \ln MILKAD_{t-j} + \sum_{k=1}^{3} \delta_k DUMQ_{k,t} ,$$

where $SALES_t$ is quarterly per capita fluid milk sales, $PRICE_t$ is the quarterly retail fluid milk price index, $SUBPRICE_t$ is the quarterly substitute price index (several products were tried including coffee, fruit juices, and nonalcoholic beverages), $INCOME_t$ is quarterly per capita disposable income, NON-MILKAD is expenditures on generic promotion, nutritional education

activities, sponsorship, public relations etc, $MILKAD_t$ is a generic milk advertising expenditures in the current and previous quarters, and $DUMQ_{k,t}$ represents quarterly dummy variables for the first, second, and third quarter of the year. Quarterly data from 1990 through 2004 are used to estimate the coefficients in equation (1). The model was estimated using ordinary-stage least squares. All monetary variables are deflated by consumer price indices to remove the impact of inflation (see the data appendix). Generic fluid milk advertising was deflated by the media cost index rather than by a retail consumer price index since media inflation is significantly higher than the general consumer price index. A media cost index developed by Kaiser and Schmit (2004), based on media advertising for fluid milk in the United States, was used as a proxy for media inflation costs in eastern Canada. In initial estimation of this model, various age demographic variables were included since changes in the age composition of these regions was thought to influence changes in per capita milk consumption. However, none of these variables were statistically significant, and hence omitted from the final estimated models. One reason why these variables were not significant may be due to the relative high degree of aggregation in them. For instance, the youngest age cohort was between 0 and 19 years of age, which is very broad, and there is evidence that children begin to reduce their consumption of milk well before 19 years of age.

One advantage of the double-log form is that it provides coefficient estimates that are direct estimates of elasticities. An estimated elasticity is a measure of the percentage change in the dependent variable, sales in this case, resulting from a one percent change in an independent variable, all else held constant. In the equation specified above, $\alpha_1$ is the own price elasticity (the elasticity of milk sales with respect to the milk price), $\alpha_2$ is the income elasticity (the elasticity of milk sales with respect to income), $\alpha_3$ is the cross price elasticity of fluid milk demand with respect to substitute price, $\alpha_4$ is the non-advertising marketing activity elasticity,

and $\omega_j$ is the generic milk advertising elasticity.

While this was the initial specification used for each region, the final specification differs for each market in terms of which variables were included in the model. In addition, the dynamic effects of advertising were modeled differently for each province. For example, for the Maritime region, only current advertising was included in the final specification. For Quebec, current and lagged advertising was included in the final specification. Lagged advertising captures any carry-over effect that advertising might have. Finally, in Ontario, lagged, but not current advertising was included in the model. Also, the non-advertising marketing variable (NON-MILKAD) was lagged in Ontario as well. These differences imply that the dynamic effects of advertising in each market are different, which may be related to the advertising campaign in each market as well as regional differences in population's reaction to advertising and promotion.

## Results

The detailed estimation results for each province are presented in Appendix II of this report. However, the elasticity estimates of important economic variables are reported in Table 1.[2] The estimated price elasticities were highly statistically significant and negative for each region. The most price responsive market was Quebec, which had an estimated price elasticity of -0.258. This means that a one percent increase in the real (inflation-adjusted) retail fluid milk price would lead to a 0.258 percent decrease in per capita milk demand in Quebec, holding all other demand factors constant. The lowest price elasticity was found in the Maritime region (-0.080) and Ontario was in the middle (-0.145). These results suggest that milk consumers in the Maritime region are the least sensitive to changes in price of all three regions, and consumers in Quebec are the most sensitive to price changes.

**Table 1. Selected elasticities, evaluated at sample means, for the three provinces.**

| Variable | Ontario | Maritime | Quebec |
|---|---|---|---|
| Price | -0.145* | -0.080* | -0.258* |
| Income | 0.329* | NA | NA |
| Price of substitutes** | 0.145* | 0.027* | 0.096* |
| Generic fluid milk advertising | 0.027* | 0.015* | 0.060* |
| Non-advertising marketing elements*** | 0.014 | 0.008* | 0.041* |

* Statistically significant from zero at the 10 percent level or less.

** Price of substitutes in Ontario is representative by the retail price index for fruit juices, while the retail price index for coffee is the substitute price used in the Maritime region and Quebec.

*** Nutrition communication, promotion, sponsorship, public relations and ingredient/calendar expenditure was aggregated into one variable.

2 It should be noted that a time trend was also included in the Ontario model, and an intercept dummy variable was included in the Quebec model. See Appendix II for details of the estimation results.

Income was positive and statistically significant in the Ontario market, but was highly insignificant (and hence deleted) in the other two markets. In Ontario, a one percent increase in real (inflation-adjusted) per capita income leads to a 0.329 percent increase in per capita demand, holding all other factors constant. The income elasticity was about twice as high in magnitude as the price elasticity in this market. On the other hand, the fact that income was not significantly different from zero in both the Maritime region and Quebec suggest that milk is more of a staple good in these markets.

The price of substitutes was statistically significant in all three regions. In Quebec, the cross-price elasticity of fluid milk demand with respect to the price of coffee was 0.096, i.e., a one percent increase in the retail price index for coffee results in a 0.096 percent increase in per capita demand for fluid milk products, holding all other demand factors constant. In the Maritime region, this elasticity was estimated to be 0.027, which is much smaller in magnitude. Thus, while different from zero, it appears that coffee prices have only a marginal impact on fluid milk demand in the Maritime region.[3] A one percent increase in the retail price for fruit juices in Ontario resulted in a 0.145 percent increase in per capita fluid milk consumption holding all other demand factors constant. Similar to the Maritime region and Quebec, the retail price of substitutes in Ontario appear to only have a marginal effect on fluid milk demand.

Generic fluid milk advertising in all three markets had a positive and statistically significant impact on per capita consumption. Quebec had the highest advertising elasticity equal to 0.060, i.e., a one percent increase in advertising results in a 0.060 percent increase in per capita demand. The Maritime region had the lowest advertising elasticity of 0.014 followed by Ontario at 0.027. A statistical test was conducted to determine whether these advertising

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3 The retail price index for tea was also included for the Maritime region, but it was statistically insignificant from zero and hence omitted in the final model.

elasticities were statistically different from each other. The results indicated that they were statistically different in each market. These advertising elasticity values are similar to those estimated in previous studies for fluid milk. For example, Kaiser and Schmit (2004) estimated a value of 0.037 for generic fluid milk advertising in the United States, which is just about the average of the ones computed for the three Canadian regions.

The elasticity for the non-advertising marketing activities was also measured. In the model, all non-advertising marketing activities were aggregated into one variable. For Ontario, total expenditures on the ingredient/calendar, nutrition communication, promotion sponsorship and public relation activities were not found to have a statistically significant effect on demand for fluid milk. However, the dynamics of investment in this aggregate marketing activity are long, ranging between three and six quarters back. In the Maritime region, the non-advertising marketing activities had a positive and marginally statistically significant impact on per capita milk demand. A one percent increase in expenditures on these activities was found to increase per capita milk demand by 0.008 percent holding all other demand factors constant. In Quebec, the combination of these activities had an elasticity value of 0.041, which was statistically significant.

## Simulation

In the previous section, the econometric models for Ontario, the Maritime region and Quebec were presented. Such models allow one to isolate the impact of generic promotion and advertising on the demand for fluid milk. Although such information is quite important, what matters most for dairy farmers is the return on their investment. Is putting more dollars in generic advertising or non-advertising elements a good investment for dairy farmers?

To answer this question, the demand equations generated using econometric tools are used to simulate the demand impact of an increase in generic advertising or promotion for a

certain period of time. From these simulations, an average and marginal rate of return can be computed. In short, the average producer rate of return (APROR) measures the producer return to total investment in generic advertising, while the marginal producer ate of return (MPROR) measures the producer return to incremental investment in generic advertising.

As expected, the econometric results show that an increase in advertising and promotion stimulates the demand for fluid milk. The resulting shift in demand creates a new equilibrium price and quantity; i.e., the point where the new demand equal the supply. To find these new equilibrium points, the supply elasticity is usually needed. However, in Canada, supply management affects the supply response differently. When quota is binding, which is the case in Canada, the supply curve is vertical at the quantity fixed by the quota. Therefore, the supply response needs to be treated differently in order to find the appropriate new price and new quantity.

In Canada, it appears that price and quantity are not linked in the short run. Shifts in demand are monitored by using butter stocks. If the demand for dairy products is greater than farm milk supply, the stock of butter decreases and production quota can be increased. The opposite is true when supply is greater than demand. These quantity adjustments are made without any price adjustment. Similarly, when the farm milk price is increased, based on cost of production calculation, there is no quantity adjustment made in the short run. Thus, the following assumption will be made when computing the ROR on an increase in advertising and promotion expenditure: An increase in demand will result in an increase in supply without any effect on price in the short run. Figure 13 illustrates our assumption.

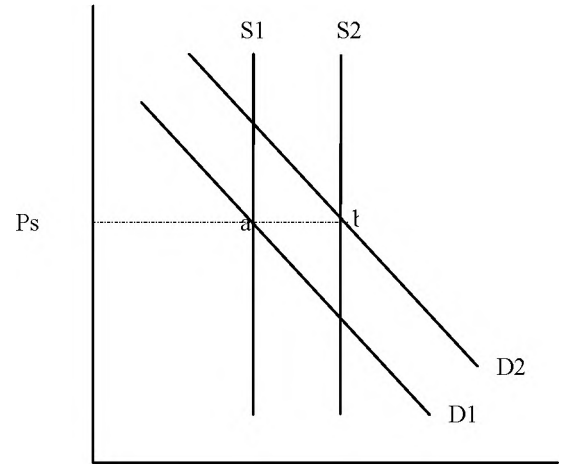


**Figure 13. Illustration of the impact of an increase in fluid milk demand following and increase in generic promotion.**

Following an increase in advertising or promotion expenditure that stimulates demand, the quantity sold moves from point *a* to point *b*. Thus, the shift in demand from D1 to D2 is met by a shift in supply, from S1 to S2. The net result is only a change in quantity from *a* to *b* at the initial price Ps.

**Rate of Return Simulations**

Both average and marginal rates of return were computed for each region. The average rate of return to advertising was calculated on the basis of simulating two scenarios over the period 2000-2004: (1) baseline simulation of demand based on historical levels of advertising, and (2) a no-advertising scenario, where advertising expenditures were set to zero over the same time period.[4] The total benefits of advertising were captured by multiplying the Class 1a price less the marginal cost of production (estimated by using cash cost expenses plus short term interest

costs and adjusted for butterfat) in the appropriate region for a specific quarter, by the increase in fluid milk quantity demand due generic advertising.[5] The total benefits obtained were then divided by total advertising costs to which ten percent was added to take into account other costs such as administrative costs related to generic advertising.

The MPROR for both advertising and promotion was calculated on the basis of running additional scenarios based on adding $10,000 per quarter to either advertising or promotion over the period 2000-2004. Similar to the APROR, the MPROR was computed by multiplying the Class 1a price less the marginal cost of production and adjusting for butterfat in the appropriate region for a specific quarter, by the increase in fluid milk demand due to the increase in advertising or non advertising marketing expenditures and then divided by 10,000.

The quantity of fluid milk consumed was computed using the estimated demand function and is relative to the baseline, which is the situation before the increase in advertising or promotion spending. Because the results are compared from a base, which already includes advertising and promotion spending, the results is interpreted as marginal effect.

For the MPROR calculation, it is important to note that the nominal increase in advertising or promotion spending was applied uniformly in each quarter, while advertising and promotion spending are usually not uniformly distributed across quarters. It should also be noted that a $10,000 per quarter increase in spending is more important in the Maritime region than in Quebec and Ontario in relative terms, given the smaller advertising and promotion budget of this region.

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4 The level of advertising was actually not zero, but set at one percent of spending level for each quarters because the logarithm of zero is not defined.

5 The average fluid milk butterfat content is used in each region and compared with average raw milk butterfat, it is assumed that the extra butterfat is used in class 4.

**Rate of Return Results**

Table 2 shows the APROR for advertising results for the three regions, averaged over all quarters between 2000 and 2004. The average rate of return was greater than one in each region and was the highest in Quebec at 7.35, followed by Ontario at 3.39 and the Maritime region at 2.23. The average rate of return means that each dollar invested in generic advertising has generated $7.35, $3.39 and $2.23 in net returns to dairy farmers in Quebec, Ontario and the Maritime region, respectively. These results suggest that dairy farmers are benefiting from generic milk advertising in each region studied.

**Table 2. Average rate of return of generic advertising for the period 2000-2004, by regions.**

| Region | APROR |
|---|---|
| Maritimes | 2.23 |
| Ontario | 3.39 |
| Quebec | 7.35 |

Source: authors' calculations

The producer marginal rates of return averaged over 20 quarters (2000-1 to 2004-4) are presented in Table 3 (the quarterly MPROR are presented in appendix IV). A large MPROR implies that extra money in advertising or promotion would generate a large return for the incremental investment. Therefore, a MPROR greater than one, could be interpreted as under-spending, while a MPROR less than one as over-spending.

The impact of increasing advertising spending (by $10,000 per quarter) is the greatest in Quebec, with a marginal producer rate of return of 5.04, followed by Ontario and the Maritime region with marginal producer rate of returns of 1.05 and 0.67, respectively. This implies that increasing advertising by $10,000 per quarter would result in an average increase in farm

revenues of $50,400, $10,500, and $6,700 per quarter in Quebec, Ontario, and the Maritime region, respectively over this period.

**Table 3. Average marginal producer rate of return of increasing generic advertising or promotion by $10,000 per quarter, for the period 2000-2004, by simulation.**

| Simulations | MPOR |
|---|---|
| Maritime region, generic advertising | 0.67 |
| Maritime region, promotion | 1.05 |
| Quebec, generic advertising | 5.04 |
| Quebec, promotion | 3.95 |
| Ontario, generic advertising | 1.05 |
| Ontario, promotion | 1.02 |

Source: authors' calculations

As for the impact of increasing expenditure on the non-advertising marketing elements, the impact is the greatest in Quebec, with a producer marginal rate of return of 3.95, followed by the Maritime region and Ontario with producer marginal rate of returns of 1.05 and 1.02, respectively. The latter number should be interpreted with caution because Ontario elasticity coefficient for non-advertising marketing elements is not significant.

It is interesting to note that Ontario's marginal rate of return for advertising is slightly above 1.0, meaning that advertising in that region is close to optimal. Increasing advertising would generate benefits that are larger than the costs of the additional spending in Quebec. On the other hand, increasing generic advertising in the Maritime region would generate less net revenues than the cost of the investment. In all regions, but the Maritime region, an incremental increase in advertising spending of $10,000 per quarter generates a better return than in non-advertising marketing elements.

From an optimal point of view, Quebec should devote the major part of future budget increases to advertising. Among the three regions, Quebec would clearly benefit the most from an increase in both advertising and promotion. Results indicate that Ontario's spending on

advertising and non-advertising marketing elements, as well as the Maritime region spending in non-advertising marketing elements are near optimal, their marginal producer rate of return (MPROR) being close to one. On the other hand, MPRORs indicate that the Maritime region has over-spent on advertising.

Considering that the three regions have pooled their advertising and promotion budget, these results suggest that advertising and non-advertising spending should increased in Quebec and maintained in real terms in Ontario, while non-advertising marketing elements should be maintained in real terms in the Maritime region and advertising reduced in real term.

Figure 14 illustrates the relationship between advertising spending and marginal rate of return on advertising, using 2000-2004 Quebec data. As previously mention, a decrease in advertising spending is likely to result in an increase in the MPROR, as illustrated for the period 2002-2004 in Figure 14.

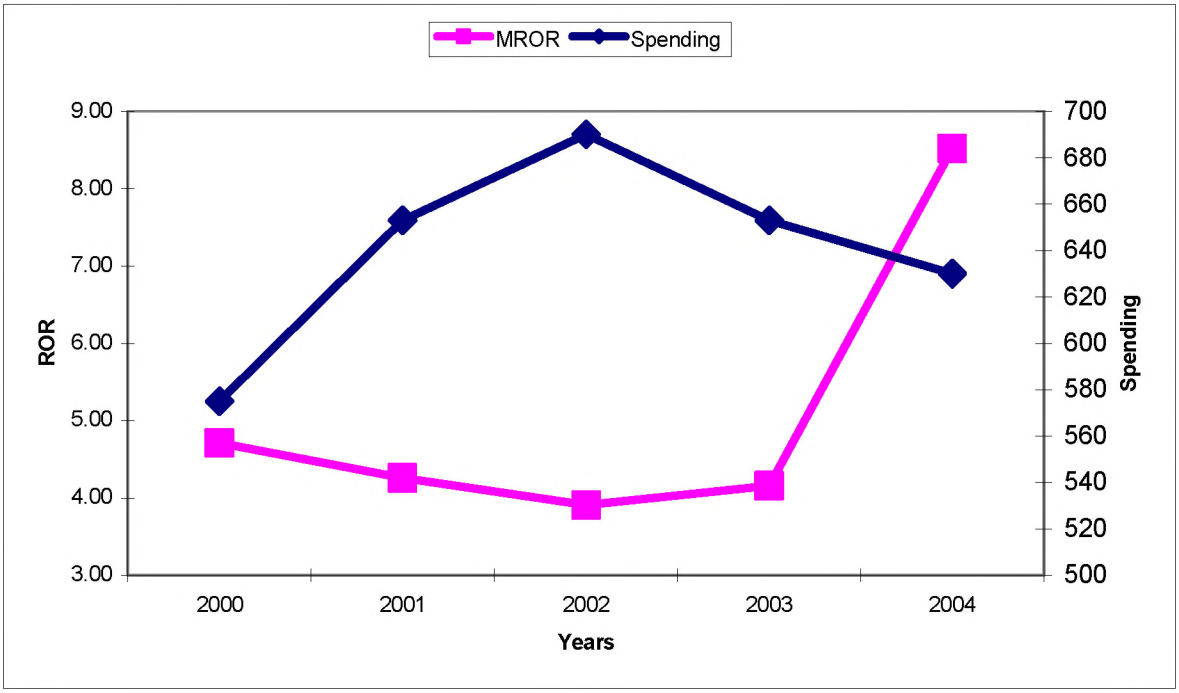


**Figure 14. Comparison of per capita annual generic advertising expenses and MPROR, Quebec, 2000-2004.**

This inverse relationship helps to understand the large differences between Quebec's MPROR for advertising and Ontario's and the Maritime region' MPROR. Other possible reasons are:

- The fact that the advertising elasticity is higher in Quebec than elsewhere, which may be due to the campaigns in Quebec being more successful or efficient;
- Despite the fact that Ontario spends more per capita than the Maritime region and Quebec, they also have a larger market to reach. Since the cost of reaching 2 million people is not twice the cost of reaching 1 million, total spending should also be considered as an important indicator;
- Dilution and saturation effects, consumers in Ontario and the Maritime region watch and read a lot of American materials (choices are numerous); while in Quebec for numerous consumers Quebec media would be the major source of information. Therefore, a dollar spend in Quebec advertising is likely to reach more people and to be more efficient.

The MPROR estimated above are not out of range when compared to those for other promotion checkoff programs. A list of estimated marginal benefit-cost ratios for selected food commodities can be found in appendix V.

Numerous other measures of the impact of generic advertising on dairy farmers' revenues can be done. Our analysis has concentrated on the important measures, the APROR as well as the MPROR. Further measures can be explored, such as the average rate of return (AROR), which is similar to the APROR with the difference that the marginal cost of producing the extra milk and the butterfat adjustment are not taken into account. The net average producer rate of return (NAPROR) can also be used. The NAPROR is simply the APROR from which advertising is netted out of the additional profit generated. Mathematically this can be simplified as NAPROR = APROR – 1. Another possible measure is the discounted average producer rate of return (DAPROR). DAPROR measures the additional producer profits generated by generic advertising, but discounted to present value to account for the time value of money. This measure is increasingly recognized as the most appropriate measure of the return of generic

advertising to producers (Capps et al. 2003). The DAPROR for Ontario, Quebec and the Maritime region (Table 4) indicates that an investment of $1.00 in generic advertising would generate, when accounting for the time value of money, $1.70, $4.77 and $0.91 to dairy farmers in Ontario, Quebec, and the Maritime region, respectively. So even though the simulation results suggest that Quebec farmers earned a profit of $7.35 per dollar spent of the assessment they paid on average over the period 2000-2004, the actual return they earned is less after taking into consideration the opportunity cost of those assessments, that is the fact that the funds could have been invested in other financial instrument and earned a return if they had not been used to pay for generic advertising, the Quebec discounted average producer rate of return (DAPROR) is 4.77. The discounted results for the three regions studied indicate that generic advertising was successful in Quebec and Ontario, and marginally successful in the Maritime region for the period 2000-2004. Table 4 summarizes the various measures of advertising investments for dairy producers in the three regions studied.

As for the MPROR estimates, the APROR estimated are not out of range when compared to those for other promotion checkoff programs. A list of estimated average producer's rate of return for selected food commodities can be found in appendix VI.

**Table 4. Return on fluid milk generic advertising investment for producers, 2000-2004.**

| | Ontario | Quebec | Maritime |
|---|---|---|---|
| Added milk receipts ($ million) | 415.1 | 528.8 | 46.6 |
| Advertising expenditures ($ million) | 47.6 | 28.2 | 8.2 |
| Average rate of return (AROR) | 8.8 | 18.9 | 5.7 |
| Average marginal cost of production ($/hl) | 29.87 | 29.87 | 29.87 |
| Marginal cost of added milk produced ($ million) | 179.1 | 228.1 | 20.1 |
| Added receipts minus added marginal costs ($ million) | 236.0 | 300.7 | 26.5 |
| Average producer rate of return (APROR) | 3.4 | 7.4 | 2.2 |
| Net average producer rate of return (NAPROR) | 2.4 | 6.4 | 1.2 |
| Discounted average producer rate of return (DAPROR)* | 1.7 | 4.8 | 0.9 |
| Marginal producer rate of return (MPROR) | 1.1 | 5.0 | 0.7 |

* The interest rate on 30 days treasury bills used as the discount rate
Source: Authors' calculation

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## Appendix 1 – Data Sources and Manipulations

### QUANTITIES

The demand models all include a term representing per capita consumption of fluid milk in the respective regions. Generally, these series are calculated by dividing total consumption of fluid milk by population in the respective region. However, as consumption data are not available for Newfoundland and Labrador, the Maritime consumption series is the sum of total fluid milk consumption in Prince Edward Island (PEI), Nova Scotia and New Brunswick. The per capita series for the Maritime region is this total divided by population in the same three provinces. Specifics regarding what data series and their sources are provided below.

| Region | Data Sources | Notes |
|---|---|---|
| Maritimes | 1990(Q1) to 1996(Q3):<br>Statistics Canada, Commercial Sales of Milk and Cream:<br>Standard milk: D231143, D231152, D231161<br>Two percent milk: D231144, D231153, D231162<br>Skim Milk: D231145, D231154, D231163<br>Buttermilk: D231146, D231155, D231164 | CDC declared sales figures were only available from 1996(Q4) onwards. As such, Statistics Canada disappearance data were used for the period 1990(Q1) to 1996(Q3).<br><br>Due to data confidentiality issues Statistics Canada data were missing for PEI and New Brunswick for the period |

| | | |
|---|---|---|
| | Chocolate drink: D231147, D231156, D231165<br>One percent milk: These data are not available across all Maritime provinces, used data provided by Ellen Goddard<br><br>1996(Q4) to 2004(Q4): Sum of Canadian Dairy Commission series: "Declared Sales of:"<br>Fluid milk: Class 1A<br>Milk based beverages: Class 1C | 1991(Q3) to 1996(Q3). As such, these values are generated via linear interpolation. Statistics Canada data for Nova Scotia do not track with CDC data over the several overlapping observations. As such, the values for Nova Scotia's total consumption is generated via linear interpolation over the 1991(Q3) to 1996(Q3) period. |
| Quebec | 1990(Q1) to 1996(Q3):<br>Statistics Canada, Commercial Sales of Milk and Cream:<br>Standard milk: D231170<br>Two percent milk: D231171<br>Skim Milk: D231172<br>Buttermilk: D231173<br>Chocolate drink: D231174<br>One percent milk: D239761<br><br>1996(Q4) to 2004(Q4): Sum of Canadian | CDC declared sales figures were only available from 1996(Q4) onwards. As such, Statistics Canada disappearance data were used for the period 1990(Q1) to 1996(Q3). |

| | | |
|---|---|---|
| | Dairy Commission series: "Declared Sales of:"<br>Fluid milk: Class 1A<br>Milk based beverages: Class 1C | |
| Ontario | 1990(Q1) to 1996(Q3): Sum of Statistics Canada series "Commercial Sales of Milk and Cream":<br>Standard milk: D231179<br>Two percent milk: D231180<br>Skim Milk: D231181<br>Buttermilk: D231182<br>Chocolate drink: D231183<br>One percent milk: D239762<br><br>1996(Q4) to 2004(Q4): Sum of Canadian Dairy Commission series: "Declared Sales of:"<br>Fluid milk: Class 1A<br>Milk based beverages: Class 1C | CDC declared sales figures were only available from 1996(Q4) onwards. As such, Statistics Canada disappearance data were used for the period 1990(Q1) to 1996(Q3). |

**PRICES**

**Fluid milk price**: are represented using a price index for low fat fluid milk provided by Ellen Goddard and updated to 2004 for Ontario and fresh milk price in the case of Quebec and the Maritime region (the latter is a weighted average of the fresh milk price in PEI, Nova Scotia and New Brunswick, with share of Maritime sales serving as weights). Fresh milk prices are sourced as follows:

*Fresh milk:*

Statistics Canada CANSIM II Series V736166 (Quebec, CPI, FRESH MILK, 2001 Basket)

Statistics Canada CANSIM II Series V735762 (PEI, CPI, FRESH MILK, 2001 Basket)

Statistics Canada CANSIM II Series V735896 (Nova Scotia, CPI, FRESH MILK, 2001 Basket)

Statistics Canada CANSIM II Series V736031 (New Brunswick, CPI, FRESH MILK, 2001 Basket)

Each region's fluid milk price index was deflated by the respective region's consumer price index or share weighted consumer price index in the case of the Maritime region.

**Related good's prices**:

The price of various related goods were gathered for analysis. These good's prices were all deflated by the country or region specific all-item CPI. The goods included in the set of related good's prices are as follows:

*Fruit Juice* – Statistics Canada CANSIM II Series V735363 (Canada, CPI, FRUIT JUICES, 2001 Basket)

*Coffee* – Statistics Canada CANSIM II Series V735383 (Canada, CPI, COFFEE, 2001 Basket)

*All Item CPI*:

Statistics Canada CANSIM II Series V735319 – (Canada, CPI, ALL-ITEMS, 2001 Basket)

Statistics Canada CANSIM II Series V735748 - (Prince Edward Island, CPI, ALL-ITEMS, 2001 Basket)

Statistics Canada CANSIM II Series V735882 - (Nova Scotia, CPI, ALL-ITEMS, 2001 Basket)

Statistics Canada CANSIM II Series V736017 - (New Brunswick, CPI, ALL-ITEMS, 2001 Basket)

Statistics Canada CANSIM II Series V736152 - (Quebec, CPI, ALL-ITEMS, 2001 Basket)

Statistics Canada CANSIM II Series V736288 - (Ontario, CPI, ALL-ITEMS, 2001 Basket)

**PERSONAL DISPOSABLE INCOME**

Per capita disposable income was calculated by dividing total personal disposable income by regional population. In the case of the Maritime region, total personal disposable income equaled the sum of PEI's, Nova Scotia's and New Brunswick's personal disposable income, while population in these three provinces was used to calculate per capita PDI. Sources of the PDI data are as follows:

Statistics Canada CANSIM II Series V691598 - (Prince Edward Island, PERSONAL DISPOSABLE INCOME)

Statistics Canada CANSIM II Series V691614 - (Nova Scotia, PERSONAL DISPOSABLE INCOME)

Statistics Canada CANSIM II Series V691630 - (New Brunswick, PERSONAL DISPOSABLE INCOME)

Statistics Canada CANSIM II Series V691646 - (Quebec, PERSONAL DISPOSABLE INCOME)

Statistics Canada CANSIM II Series V691662 - (Ontario, PERSONAL DISPOSABLE INCOME)

As PDI is an annual measure, quarterly values were developing by linearly interpolating between annual points. Further, data for 2004 are not yet available; as such a linear trend was used to develop the PDI values for 2004.

**POPULATION**

Quarterly estimate of each provinces population were gathered from the following sources:

Statistics Canada CANSIM II Series V8 - (Prince Edward Island, ESTIMATES OF POPULATION)

Statistics Canada CANSIM II Series V9 - (Nova Scotia, ESTIMATES OF POPULATION)

Statistics Canada CANSIM II Series V10 - (New Brunswick, ESTIMATES OF POPULATION)

Statistics Canada CANSIM II Series V11 - (Quebec, ESTIMATES OF POPULATION)

Statistics Canada CANSIM II Series V12 - (Ontario, ESTIMATES OF POPULATION)

## ADVERTISING AND PROMOTION DATA

*Quebec*

For Quebec, yearly data for the period 1990 to 2001 were extracted from a detailed retrospective advertising, sponsorship and promotion expenses report realized by Nicole Dubé of FPLQ. The data for the period 2002-2004 were completed by Miss Dubé, using internal information. The quarterly break out for advertising was realized using Ellen Goddard's quarterly percentage, and final results were approved by Miss Dubé. As for promotion and sponsorship break out, they were done using verbal information from Miss Dubé, and the final result was also approved by her. For the period 1999-2004, quarterly break out was directly completed by Miss Dubé using internal information. For the period 1990-1992, production and talent had to be estimated, and was established at 16% of total advertising budget. Advertising and promotion-sponsorship expenses used in the econometric model do not include the research budget.

*Maritime region*

For the Maritime region, data were not available before 1993. The 1993 and 1994 data are from Ellen Goddard. From 1995 to 2003, data are from Milk Maritime region Inc, and 2004 data are from the Dairy Farmers of Canada. The data 1995-2001 are from the Statement of income and expenses reports at the end of the dairy year. Reported and used in the econometric model are media expenses, production expenses, promotion expenses, school milk expenses and nutrition communication expenses. Unfortunately, only the last monthly report was available for each year. Although the yearly spending is available from that report, quarterly spending was not. The latter had to be estimated. For the period 1993-1997, the break out for the promotion and sponsorship data was based on the year 2000 monthly budgeted expenses. For the advertising break out for the same period, it was based on the 1995/96 blocking sheets. For the period 1998-

2000, the break out for sponsorship and promotion as well as advertising was based on the 2000 monthly budgeted expenses. For the year 2001, the promotion and sponsorship quarterly break out was based on the year 2000 budgeted expenses, while for advertising Y2001 blocking sheets were available. The data 2002-2004 are from marketing plan budget. For the period, the breakout for advertising, promotion and sponsorship was based on 2002 monthly budgeted expenses, media schedules and marketing plans.

*Ontario*

Advertising and promotion data for Ontario were obtained from the Dairy Farmers of Ontario, Michael Pearce and Ellen Goddard. The data provided by Michael Pearce were broken down into the following categories: advertising media, advertising production, ingredient/calendar media and production, nutrition communication, promotions and public relations. These data were available over the period 1998 to 2004. For the period 1990 to 1997, the dollar value of production and media expenditure on advertising and the various other non-advertising marketing effects are drawn from Budget Control charts and information provided directly by Ellen Goddard. Expenditure on media and production activities related to advertising, ingredient/calendar, nutrition communication, promotion, sponsorship/public relations was used in the econometric models. Note that for two Ontario series, missing data were a problem. In the first instance, ingredient/calendar expenditure data is not readily available for 1990 to 1992. For these years, a value of 1 is used to reflect that expenditure occurred in those years, but the precise amount is not readily available. Secondly, public relations expenditure prior to 1998 was not available. After careful investigation, Michael Pearce indicated that DFO spent approximately $85,000 per year on public relations in these years. As such, quarterly PR expenditure was set at $21,250 from 1990 to 1997 (inclusive).

Because the models for the Maritime region and Quebec gave the best results when their non-advertising marketing activities were aggregated, and given the focus in this report on generic advertising, it was decide to aggregate the non-advertising marketing activities in Ontario into one variable as well. This results in a simpler model. Moreover, the assumption that expenditure on ingredient/calendar, nutrition communication, promotion, sponsorship/public relations has the same effect in the Ontario model was supported by statistical analysis.[6] As well, the model where the non-avertising elements are aggregated into one variable fits the data just as well as the model where these non-advertising elements are treated as separate effects.

It should be noted, however, that the advertising elasticity for Ontario varies according to whether the the non-advertising elements are included as separate and distinct variables or as an aggregate. In particular, when ingredient/calendar, nutrition communication, promotion, sponsorship/public relations where included as separate variables, the advertising elasticity for Ontario was 0.047 and was highly significant. This is an important point as it suggests the analysis undertaken here reflects a conservative approach to the calculation of the rate of return – the higher the advertising elasticity, the high the rate of return will be, all other things held constant. Moreover, sensitivity of the results to how the non-advertising elements are incorporated suggests scope for further work, with close attention to the inclusion of program expenditures in the various activities. This breakdown will need more attention in order to determine the effectiveness of these individual non-advertising elements.

6 The null hypothesis that the estimated coefficients on these variables are equal could not be rejected at the one percent level.

## Appendix II – Econometric Results

### Ontario

Table A1 shows the econometrics results for the Ontario model. The model fits the data well, with an adjusted $R^2$ of 0.94. As shown, price and income effects are statistically significant from zero at typical significance levels, as are the seasonal dummy variables and the time trend. The lagged advertising variables are significant at the five percent level. The latter are included using a second order polynomial distributed lag structure with left and right hand side end point restrictions. The non-advertising marketing elements are also included using a second order polynomial distributed lag structure with left and right hand side end point restrictions. Alternative lag structures were considered for both advertising and the non-advertising elements, but the reported results were found to produce the most satisfactory results.

**Table A1. Regression results for the Ontario Model[a]**

| | Estimate | t-statistic |
|---|---|---|
| Constant | 1.573** | 2.573 |
| Fluid milk price | -0.145* | -1.707 |
| Fruit juice price | 0.145** | 2.587 |
| Per capita income | 0.329*** | 2.784 |
| Quarter 1 indicator variable | -0.024*** | -5.075 |
| Quarter 2 indicator variable | -0.040*** | -8.533 |
| Quarter 3 indicator variable | -0.047*** | -9.943 |
| Advertising lagged three quarters | 0.008** | 2.255 |
| Advertising lagged four quarters | 0.011** | 2.255 |
| Advertising lagged five quarters | 0.008** | 2.255 |
| Sum of advertising coefficients | 0.027* | 2.255 |
| Non-advertising elements lagged three quarters | 0.003 | 0.835 |
| Non-advertising elements lagged four quarters | 0.004 | 0.835 |
| Non-advertising elements lagged five quarters | 0.004 | 0.835 |
| Non-advertising elements lagged six quarters | 0.003 | 0.835 |
| Sum of non-advertising coefficients | 0.014 | 0.835 |
| Time trend | -0.0028*** | -7.420 |
| Adjusted R2 | 0.94 | |
| Durbin-Watson statistic | 1.81 | |

[a] Except for the quarterly dummy variables and time trend, all explanatory variables are included in natural logarithms, deflated and, where appropriate, in per capita terms.

*** Denotes significance at the one percent level

** Denotes significance at the five percent level

* Denotes significance at the ten percent level

**Maritime region**

Table A2 shows the econometrics results for the Maritime region model. The model did not fit the data as well as the other two regional models. The adjusted $R^2$ of 0.47 indicates that the independent variables explained 47 percent of the variation in per capita fluid milk sales over the estimation period, which is substantially lower than in the Ontario and Quebec models. One reason for this is that the quality of the data for this region is not as good as that for the other two provinces. For example, the per capita consumption data is problematic because of the swell in the summer-time population that occurs in this region that is not accounted for by the population estimates used to convert consumption to a per capita basis.

Still, all the variables had signs predicted by economic theory, and most were statistically significant at conventional levels. The own price elasticity, advertising, and seasonal indicator variables were all statistically significant at the one percent confidence level. The substitute coffee price was significant at the ten percent level, and the lagged promotion, nutritional education, and sponsorship variable was marginally significant. Unlike the other two models, there does not appear to be a carry-over effect to advertising, i.e., current, but not lagged advertising impacts per capita consumption.

**Table A2. Regression results for the Maritime region Model[a]**

| | Estimate | t-statistic |
|---|---|---|
| Constant | -3.980* | -46.91 |
| Fluid milk price | -0.076* | -3.12 |
| Coffee price | 0.027*** | 1.45 |
| Quarter 1 indicator variable | -0.020* | -2.27 |
| Quarter 2 indicator variable | -0.046* | -5.16 |
| Quarter 3 indicator variable | -0.036* | -3.88 |
| Advertising current quarter | 0.015* | 2.29 |
| Non-advertising activities lagged two quarters | 0.008 | 1.21 |
| Adjusted R2 | 0.47 | |
| Durbin-Watson statistic | 1.41 | |

[a] Except for the quarterly dummy variables, all explanatory variables are included in natural logarithms, deflated and, where appropriate, in per capita terms.

*** Denotes significance at the one percent level

** Denotes significance at the five percent level

*** Denotes significance at the ten percent level

**Quebec**

Table A2 shows the econometrics results for the Quebec model. The model fit the data well as indicated by the adjusted $R^2$ of 0.82, i.e., the independent variables explained 82 percent of the variation in the per capita fluid milk sales over the estimation period.

All the variables had signs predicted by economic theory, and all were statistically significant at conventional levels. Similar to Ontario, a polynomial distributed lag model was used to capture the carry-over effect of advertising. In this case, current advertising and four lagged values of advertising were included. End point restrictions were imposed.

**Table A3. Regression results for the Quebec Model[a]**

| | Estimate | t-statistic |
|---|---|---|
| Constant | -5.082* | -11.28 |
| Fluid milk price | -0.258* | -4.10 |
| Coffee price | 0.096* | 3.25 |
| Quarter 1 indicator variable | -0.039* | -3.65 |
| Quarter 2 indicator variable | -0.097* | -5.62 |
| Quarter 3 indicator variable | -0.121* | -5.19 |
| Advertising current period | 0.00863** | 1.75 |
| Advertising lagged one quarters | 0.01381** | 1.75 |
| Advertising lagged two quarters | 0.01553** | 1.75 |
| Advertising lagged three quarters | 0.01381* | 1.75 |
| Advertising lagged four quarters | 0.00863** | 1.75 |
| Sum of advertising coefficients | 0.061** | 1.75 |
| Non-advertising activities | 0.041* | 2.14 |
| Adjusted R2 | 0.82 | |
| Durbin-Watson statistic | 1.35 | |

[a] Except for the quarterly dummy variables, all explanatory variables are included in natural logarithms, deflated and, where appropriate, in per capita terms.

*** Denotes significance at the one percent level

** Denotes significance at the five percent level

* Denotes significance at the ten percent level

## Appendix III. Data Used in the Econometric Models

### Maritime region

| Year.quarter | Per capita milk sales (liters) | Population (#) | Consumer price index milk | Consumer price index Non-alcoholic beverages | Consumer price index coffee | Promotion expenditures ($) | Nutrition education expenditures ($) | Sponsorship expenditures ($) | Advertising expenditures ($) | Media cost index (2003=1) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1992:4 | 24.2 | 2,380,186 | 99.7 | 104.6 | 96.7 | 80,106 | 21,045 | 59,061 | 36,879 | 1.767 |
| 1993:1 | 24.5 | 2,382,423 | 99.7 | 103.0 | 96.6 | 66,724 | 36,350 | 30,374 | 92,199 | 2.041 |
| 1993:2 | 24.0 | 2,383,010 | 99.7 | 106.9 | 96.3 | 34,490 | 27,741 | 6,750 | 253,546 | 1.661 |
| 1993:3 | 23.6 | 2,384,922 | 99.8 | 105.5 | 96.2 | 83,083 | 10,522 | 72,561 | 78,369 | 2.029 |
| 1993:4 | 23.7 | 2,386,020 | 100.1 | 105.5 | 96.2 | 119,981 | 26,500 | 93,481 | 38,016 | 1.643 |
| 1994:1 | 24.3 | 2,385,340 | 101.4 | 107.5 | 96.7 | 93,848 | 45,773 | 48,076 | 95,040 | 2.125 |
| 1994:2 | 23.8 | 2,384,358 | 101.4 | 104.3 | 97.3 | 45,615 | 34,932 | 10,684 | 261,359 | 1.763 |
| 1994:3 | 23.5 | 2,385,047 | 101.3 | 97.0 | 125.6 | 128,098 | 13,250 | 114,848 | 80,784 | 2.078 |
| 1994:4 | 23.6 | 2,384,426 | 101.4 | 94.0 | 167.2 | 93,548 | 23,695 | 69,853 | 45,846 | 1.722 |
| 1995:1 | 24.6 | 2,382,969 | 101.4 | 105.6 | 170.6 | 76,853 | 40,928 | 35,924 | 114,615 | 1.791 |
| 1995:2 | 25.0 | 2,381,709 | 101.4 | 99.6 | 167.1 | 39,218 | 31,235 | 7,983 | 315,191 | 1.559 |
| 1995:3 | 24.3 | 2,381,021 | 102.2 | 97.3 | 164.5 | 97,667 | 11,848 | 85,819 | 97,423 | 1.722 |
| 1995:4 | 23.9 | 2,381,349 | 103.4 | 91.1 | 159.3 | 199,312 | 39,432 | 159,880 | 75,979 | 1.543 |
| 1996:1 | 25.1 | 2,380,353 | 104.5 | 97.2 | 154.5 | 150,334 | 68,110 | 82,224 | 189,948 | 1.738 |
| 1996:2 | 25.0 | 2,378,953 | 104.6 | 94.8 | 148.0 | 70,251 | 51,979 | 18,272 | 522,356 | 1.501 |
| 1996:3 | 24.3 | 2,379,283 | 104.7 | 95.6 | 146.3 | 216,140 | 19,716 | 196,424 | 161,455 | 1.612 |
| 1996:4 | 24.9 | 2,378,343 | 105.0 | 91.5 | 143.5 | 99,671 | 41,697 | 57,974 | 234,104 | 1.433 |
| 1997:1 | 24.1 | 2,376,308 | 105.0 | 97.2 | 143.1 | 253,191 | 72,021 | 181,170 | 399,355 | 1.505 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1997:2 | 23.4 | 2,373,558 | 105.0 | 90.3 | 147.5 | 127,432 | 54,964 | 72,468 | 302,959 | 1.394 |
| 1997:3 | 23.8 | 2,372,144 | 105.0 | 92.1 | 154.0 | 71,576 | 20,848 | 50,727 | 440,667 | 1.548 |
| 1997:4 | 24.8 | 2,369,015 | 105.0 | 82.3 | 152.8 | 55,058 | 30,045 | 25,013 | 104,008 | 1.383 |
| 1998:1 | 23.7 | 2,366,457 | 105.7 | 91.6 | 152.5 | 130,062 | 51,895 | 78,167 | 260,019 | 1.428 |
| 1998:2 | 23.2 | 2,361,434 | 105.9 | 83.6 | 151.3 | 70,871 | 39,604 | 31,267 | 715,053 | 1.322 |
| 1998:3 | 23.7 | 2,358,209 | 106.0 | 85.7 | 147.4 | 36,909 | 15,022 | 21,887 | 221,016 | 1.468 |
| 1998:4 | 24.9 | 2,357,464 | 106.1 | 83.2 | 145.6 | 68,455 | 35,123 | 33,332 | 246,828 | 1.312 |
| 1999:1 | 24.0 | 2,354,985 | 106.4 | 90.9 | 144.7 | 164,829 | 60,666 | 104,163 | 326,165 | 1.359 |
| 1999:2 | 23.4 | 2,352,892 | 106.4 | 88.6 | 143.5 | 87,963 | 46,298 | 41,665 | 211,567 | 1.258 |
| 1999:3 | 24.1 | 2,354,163 | 106.4 | 84.8 | 142.5 | 46,727 | 17,561 | 29,166 | 96,968 | 1.398 |
| 1999:4 | 25.0 | 2,355,424 | 106.4 | 85.0 | 138.7 | 65,455 | 29,794 | 35,661 | 437,723 | 1.248 |
| 2000:1 | 24.3 | 2,353,772 | 108.9 | 85.8 | 136.7 | 162,903 | 51,463 | 111,440 | 578,420 | 1.245 |
| 2000:2 | 23.6 | 2,350,861 | 108.6 | 84.8 | 135.8 | 83,850 | 39,274 | 44,576 | 375,192 | 1.153 |
| 2000:3 | 23.9 | 2,348,928 | 109.3 | 84.8 | 134.6 | 46,100 | 14,897 | 31,203 | 171,963 | 1.280 |
| 2000:4 | 24.7 | 2,348,000 | 109.6 | 78.5 | 132.7 | 38,966 | 18,364 | 20,602 | 714,233 | 1.143 |
| 2001:1 | 24.5 | 2,345,015 | 111.2 | 86.4 | 132.4 | 96,102 | 31,720 | 64,383 | 285,693 | 1.271 |
| 2001:2 | 23.2 | 2,342,599 | 111.9 | 77.8 | 132.3 | 49,960 | 24,207 | 25,753 | 257,124 | 1.177 |
| 2001:3 | 23.6 | 2,340,937 | 112.2 | 79.2 | 129.7 | 27,209 | 9,182 | 18,027 | 171,416 | 1.307 |
| 2001:4 | 24.6 | 2,341,288 | 113.0 | 78.5 | 128.7 | 38,650 | 23,421 | 15,229 | 496,317 | 1.167 |
| 2002:1 | 23.8 | 2,340,971 | 114.9 | 84.6 | 127.1 | 96,859 | 40,454 | 56,405 | 437,927 | 1.195 |
| 2002:2 | 23.5 | 2,339,963 | 116.4 | 81.5 | 125.1 | 63,024 | 30,873 | 32,151 | 335,744 | 1.107 |
| 2002:3 | 23.8 | 2,341,217 | 117.5 | 81.5 | 123.0 | 20,735 | 11,710 | 9,025 | 189,768 | 1.229 |
| 2002:4 | 24.4 | 2,342,772 | 117.8 | 70.8 | 121.9 | 66,534 | 29,608 | 36,927 | 317,474 | 1.097 |
| 2003:1 | 23.6 | 2,342,191 | 119.7 | 81.5 | 122.6 | 150,259 | 51,140 | 99,119 | 331,277 | 1.165 |
| 2003:2 | 23.4 | 2,342,093 | 120.4 | 81.3 | 125.4 | 66,237 | 39,028 | 27,209 | 400,293 | 1.079 |
| 2003:3 | 23.7 | 2,342,677 | 120.3 | 84.1 | 126.4 | 45,900 | 14,804 | 31,096 | 331,277 | 1.199 |
| 2003:4 | 24.6 | 2,344,342 | 120.5 | 76.1 | 127.5 | 94,277 | 43,670 | 50,607 | 440,107 | 1.070 |
| 2004:1 | 23.9 | 2,344,390 | 123.7 | 80.9 | 126.2 | 211,269 | 75,430 | 135,839 | 227,642 | 1.089 |
| 2004:2 | 22.2 | 2,343,929 | 125.1 | 80.5 | 127.0 | 94,854 | 57,565 | 37,289 | 424,931 | 1.008 |
| 2004:3 | 23.0 | 2,343,235 | 125.1 | 79.7 | 127.8 | 64,451 | 21,835 | 42,616 | 424,931 | 1.120 |

**Quebec**

| Year.quarter | Total milk sales (kiloliters) | Population (#) | Consumer price index milk | Consumer price index Non-alcoholic beverages | Consumer price index coffee | Advertising expenditures ($) | Promotion expenditures ($) | Nutrition education expenditures ($) | Media cost index (2003=1) | Indicator variable |
|---|---|---|---|---|---|---|---|---|---|---|
| 1990:1 | 174,177 | 6,960,619 | 96.7 | 90.2 | 116.6 | 896,021 | 84,729 | 45,900 | 2.324 | 0 |
| 1990:2 | 165,556 | 6,979,957 | 97.8 | 90.5 | 115.3 | 691,616 | 235,757 | 25,500 | 1.939 | 0 |
| 1990:3 | 158,393 | 7,003,876 | 97.8 | 89.4 | 115.5 | 607,472 | 264,193 | 84,150 | 2.139 | 0 |
| 1990:4 | 179,323 | 7,025,692 | 97.9 | 87.5 | 113.6 | 894,260 | 31,179 | 99,450 | 1.832 | 0 |
| 1991:1 | 178,708 | 7,033,013 | 97.9 | 100.0 | 113.2 | 787,156 | 134,580 | 50,400 | 2.367 | 0 |
| 1991:2 | 170,311 | 7,047,895 | 97.9 | 98.8 | 111.3 | 607,585 | 341,960 | 28,000 | 1.950 | 0 |
| 1991:3 | 165,461 | 7,064,586 | 98.5 | 99.8 | 109.1 | 533,664 | 400,880 | 92,400 | 2.059 | 0 |
| 1991:4 | 177,066 | 7,077,753 | 98.9 | 100.3 | 106.0 | 785,609 | 75,780 | 109,200 | 1.751 | 0 |
| 1992:1 | 178,049 | 7,080,290 | 98.9 | 101.2 | 103.1 | 828,994 | 236,025 | 55,080 | 2.297 | 0 |
| 1992:2 | 169,545 | 7,094,522 | 99.6 | 97.3 | 101.4 | 680,304 | 551,610 | 30,600 | 1.763 | 0 |
| 1992:3 | 161,804 | 7,108,000 | 100.8 | 101.2 | 99.2 | 626,358 | 675,300 | 100,980 | 2.030 | 0 |
| 1992:4 | 168,855 | 7,127,279 | 100.9 | 100.2 | 96.7 | 819,868 | 171,765 | 119,340 | 1.675 | 0 |
| 1993:1 | 173,944 | 7,135,959 | 95.8 | 99.6 | 96.6 | 788,041 | 242,985 | 56,160 | 1.934 | 0 |
| 1993:2 | 153,611 | 7,145,610 | 94.1 | 100.2 | 96.3 | 664,047 | 567,090 | 31,200 | 1.574 | 0 |
| 1993:3 | 157,401 | 7,155,273 | 94.1 | 96.6 | 96.2 | 615,553 | 694,760 | 102,960 | 1.923 | 1 |
| 1993:4 | 165,610 | 7,170,979 | 94.0 | 97.7 | 96.2 | 1,042,780 | 177,465 | 121,680 | 1.557 | 1 |
| 1994:1 | 175,684 | 7,177,114 | 95.0 | 99.1 | 96.7 | 1,116,718 | 295,470 | 57,240 | 2.014 | 1 |
| 1994:2 | 165,953 | 7,183,908 | 97.2 | 94.7 | 97.3 | 251,933 | 673,620 | 31,800 | 1.671 | 1 |
| 1994:3 | 160,438 | 7,191,884 | 97.2 | 90.8 | 125.6 | 462,083 | 835,620 | 104,940 | 1.969 | 1 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1994:4 | 173,575 | 7,200,815 | 97.3 | 91.2 | 167.2 | 1,289,329 | 228,690 | 124,020 | 1.632 | 1 |
| 1995:1 | 171,069 | 7,205,010 | 97.3 | 99.6 | 170.6 | 1,087,954 | 298,530 | 58,500 | 1.698 | 1 |
| 1995:2 | 166,333 | 7,210,359 | 97.3 | 101.2 | 167.1 | 214,439 | 681,560 | 32,500 | 1.478 | 1 |
| 1995:3 | 160,786 | 7,219,446 | 97.9 | 98.0 | 164.5 | 477,322 | 844,830 | 107,250 | 1.632 | 1 |
| 1995:4 | 182,209 | 7,229,055 | 99.7 | 101.1 | 159.3 | 1,242,053 | 230,280 | 126,750 | 1.462 | 1 |
| 1996:1 | 175,175 | 7,233,634 | 99.7 | 104.3 | 154.5 | 1,948,989 | 315,606 | 59,580 | 1.647 | 1 |
| 1996:2 | 165,154 | 7,238,162 | 99.7 | 102.6 | 148.0 | 369,599 | 717,271 | 33,100 | 1.423 | 1 |
| 1996:3 | 161,342 | 7,246,896 | 100.1 | 103.1 | 146.3 | 648,512 | 891,265 | 109,230 | 1.528 | 1 |
| 1996:4 | 176,444 | 7,257,620 | 104.1 | 97.5 | 143.5 | 1,720,703 | 246,096 | 129,090 | 1.358 | 1 |
| 1997:1 | 170,760 | 7,262,954 | 104.1 | 96.5 | 143.1 | 1,450,641 | 369,585 | 60,840 | 1.427 | 1 |
| 1997:2 | 164,443 | 7,267,834 | 104.1 | 90.8 | 147.5 | 273,846 | 827,050 | 33,800 | 1.321 | 1 |
| 1997:3 | 160,766 | 7,274,630 | 104.2 | 89.1 | 154.0 | 638,991 | 1,036,260 | 111,540 | 1.467 | 1 |
| 1997:4 | 170,801 | 7,282,895 | 107.0 | 91.2 | 152.8 | 1,837,754 | 298,605 | 131,820 | 1.311 | 1 |
| 1998:1 | 159,279 | 7,286,036 | 106.9 | 97.3 | 152.5 | 1,279,011 | 374,310 | 62,100 | 1.353 | 1 |
| 1998:2 | 156,846 | 7,290,531 | 108.8 | 98.4 | 151.3 | 318,947 | 838,320 | 34,500 | 1.253 | 1 |
| 1998:3 | 157,397 | 7,295,973 | 109.6 | 93.6 | 147.4 | 318,947 | 1,049,910 | 113,850 | 1.392 | 1 |
| 1998:4 | 172,162 | 7,305,345 | 111.0 | 88.5 | 145.6 | 1,564,596 | 301,860 | 134,550 | 1.243 | 1 |
| 1999:1 | 159,925 | 7,310,286 | 111.8 | 96.3 | 144.7 | 1,659,180 | 298,500 | 63,000 | 1.288 | 1 |
| 1999:2 | 156,664 | 7,315,106 | 113.1 | 94.9 | 143.5 | 326,982 | 688,000 | 35,000 | 1.193 | 1 |
| 1999:3 | 158,426 | 7,323,308 | 113.1 | 92.6 | 142.5 | 222,958 | 848,500 | 115,500 | 1.325 | 1 |
| 1999:4 | 168,174 | 7,334,785 | 113.1 | 90.1 | 138.7 | 2,249,065 | 225,000 | 136,500 | 1.183 | 1 |
| 2000:1 | 161,319 | 7,340,337 | 114.8 | 100.5 | 136.7 | 1,773,567 | 396,120 | 63,000 | 1.180 | 1 |
| 2000:2 | 155,369 | 7,347,252 | 115.4 | 97.2 | 135.8 | 387,433 | 883,240 | 35,000 | 1.092 | 1 |
| 2000:3 | 152,474 | 7,357,029 | 115.4 | 97.6 | 134.6 | 254,100 | 1,108,820 | 115,500 | 1.213 | 1 |
| 2000:4 | 165,840 | 7,368,854 | 115.7 | 93.5 | 132.7 | 1,814,900 | 322,620 | 136,500 | 1.083 | 1 |
| 2001:1 | 159,393 | 7,374,065 | 118.3 | 103.5 | 132.4 | 2,029,983 | 272,760 | 63,000 | 1.195 | 1 |
| 2001:2 | 153,405 | 7,383,830 | 119.7 | 101.5 | 132.3 | 406,510 | 636,520 | 35,000 | 1.107 | 1 |
| 2001:3 | 151,108 | 7,396,990 | 119.7 | 102.7 | 129.7 | 304,718 | 779,860 | 115,500 | 1.229 | 1 |
| 2001:4 | 163,167 | 7,413,392 | 119.6 | 99.2 | 128.7 | 2,085,568 | 199,260 | 136,500 | 1.097 | 1 |
| 2002:1 | 154,237 | 7,421,309 | 122.3 | 104.7 | 127.1 | 2,246,703 | 238,125 | 63,900 | 1.137 | 1 |
| 2002:2 | 150,238 | 7,432,197 | 123.6 | 101.9 | 125.1 | 464,004 | 568,550 | 35,500 | 1.053 | 1 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2002:3 | 150,407 | 7,445,745 | 123.5 | 104.9 | 123.0 | 329,242 | 688,250 | 117,150 | 1.169 | 1 |
| 2002:4 | 162,207 | 7,460,604 | 123.4 | 97.3 | 121.9 | 2,097,086 | 163,575 | 138,450 | 1.044 | 1 |
| 2003:1 | 153,965 | 7,466,263 | 125.9 | 104.7 | 122.6 | 1,986,498 | 214,140 | 63,900 | 1.089 | 1 |
| 2003:2 | 150,692 | 7,477,217 | 126.9 | 102.6 | 125.4 | 378,883 | 520,580 | 35,500 | 1.008 | 1 |
| 2003:3 | 152,295 | 7,492,333 | 127.0 | 103.4 | 126.4 | 362,753 | 624,290 | 117,150 | 1.120 | 1 |
| 2003:4 | 165,781 | 7,509,504 | 126.6 | 102.0 | 127.5 | 2,160,785 | 139,590 | 138,450 | 1.000 | 1 |
| 2004:1 | 159,355 | 7,516,950 | 124.0 | 104.6 | 126.2 | 2,471,101 | 195,037 | 64,800 | 0.992 | 1 |
| 2004:2 | 154,459 | 7,527,410 | 124.6 | 104.2 | 127.0 | 89,588 | 483,674 | 36,000 | 0.925 | 1 |
| 2004:3 | 154,571 | 7,542,760 | 128.6 | 104.6 | 127.8 | 2,095,239 | 574,098 | 118,800 | 0.954 | 1 |
| 2004:4 | 160,180 | 7,560,592 | 128.7 | 103.4 | 127.8 | 89,588 | 119,437 | 140,400 | 0.890 | 1 |

**Ontario**

| YEAR | Total fluid milk sales (kilolitres) | Population (#) | Consumer price index - low fat fluid milk | Consumer price index - fruit juice | Personal disposable income ($'000,000) | Advertising media and promotion expenditure ($) | Promotion media and production expenditure ($) | Nutrition comm.expenditure ($) | Ingredient, Calendar media and production expenditure ($) | Public relations ($) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1990:1 | 254498 | 10191520 | 94.2 | 102.4 | 187079 | 769524 | 167654 | 92688 | 1 | 21250 |
| 1990:2 | 252942 | 10239920 | 94.1 | 108.1 | 188488 | 1186380 | 181626 | 92688 | 1 | 21250 |
| 1990:3 | 247276 | 10297880 | 95.6 | 109.4 | 189896 | 1772118 | 127595 | 92688 | 1 | 21250 |
| 1990:4 | 258346 | 10347450 | 101.4 | 105.4 | 191305 | 1432839 | 235565 | 92688 | 1 | 21250 |
| 1991:1 | 250733 | 10358510 | 101.1 | 100.9 | 192713 | 1378284 | 238758 | 95009 | 1 | 21250 |
| 1991:2 | 249026 | 10389750 | 100.5 | 100.1 | 193952 | 1264887 | 223826 | 95009 | 1 | 21250 |
| 1991:3 | 253188 | 10428130 | 100.2 | 101.1 | 195192 | 1280790 | 111160 | 95009 | 1 | 21250 |
| 1991:4 | 256493 | 10462590 | 99.4 | 96.1 | 196431 | 1196763 | 289310 | 95009 | 1 | 21250 |
| 1992:1 | 251741 | 10485260 | 98.8 | 98.8 | 197670 | 1185038 | 336401 | 115996 | 1 | 21250 |
| 1992:2 | 245908 | 10525770 | 98.9 | 100.9 | 198234 | 958984 | 314434 | 115996 | 1 | 21250 |
| 1992:3 | 243577 | 10569810 | 100.1 | 102.2 | 198798 | 1751466 | 103190 | 115996 | 1 | 21250 |
| 1992:4 | 252442 | 10608480 | 102.2 | 98 | 199361 | 1579406 | 278070 | 115996 | 1 | 21250 |
| 1993:1 | 244404 | 10628020 | 102.5 | 94.7 | 199925 | 1312470 | 333565 | 109738 | 33225 | 21250 |
| 1993:2 | 242608 | 10655100 | 102.0 | 90.1 | 200449 | 2117848 | 351265 | 109738 | 33225 | 21250 |
| 1993:3 | 242687 | 10688390 | 100.9 | 89.6 | 200972 | 1659731 | 514133 | 109738 | 33225 | 21250 |
| 1993:4 | 250621 | 10727300 | 100.3 | 89.9 | 201496 | 2403781 | 150677 | 109738 | 33225 | 21250 |
| 1994:1 | 251278 | 10743540 | 93.0 | 90.7 | 202019 | 1972760 | 224977 | 121514 | 233175 | 21250 |
| 1994:2 | 242224 | 10775740 | 98.3 | 89.5 | 203832 | 1552870 | 335577 | 121514 | 233175 | 21250 |
| 1994:3 | 244273 | 10818250 | 101.3 | 88.4 | 205646 | 1869337 | 1415 | 121514 | 233175 | 21250 |
| 1994:4 | 253891 | 10859720 | 101.0 | 87 | 207459 | 1796428 | 65195 | 121514 | 233175 | 21250 |
| 1995:1 | 245355 | 10874840 | 100.7 | 88.9 | 209272 | 2616140 | 91908 | 166338 | 208175 | 21250 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1995:2 | 244420 | 10906570 | 101.9 | 91.2 | 209649 | 2153236 | 732768 | 166338 | 208175 | 21250 |
| 1995:3 | 243110 | 10949980 | 100.8 | 92 | 210025 | 1749883 | 15078 | 166338 | 208175 | 21250 |
| 1995:4 | 252975 | 10993490 | 99.8 | 92.7 | 210402 | 2643132 | 250500 | 166338 | 208175 | 21250 |
| 1996:1 | 253474 | 11009590 | 98.7 | 95.7 | 210778 | 3444098 | 136649 | 161256 | 310125 | 21250 |
| 1996:2 | 248249 | 11037860 | 97.9 | 97.8 | 213182 | 2405303 | 394361 | 161256 | 310125 | 21250 |
| 1996:3 | 244245 | 11083050 | 97.7 | 99.1 | 215586 | 2042303 | 408271 | 161256 | 310125 | 21250 |
| 1996:4 | 259272 | 11130850 | 99.3 | 99 | 217990 | 2355282 | 247781 | 161256 | 310125 | 21250 |
| 1997:1 | 252604 | 11146670 | 98.8 | 98.7 | 220394 | 2241417 | 259258 | 131294 | 281275 | 21250 |
| 1997:2 | 248746 | 11180470 | 99.3 | 98.4 | 223161 | 2080417 | 239758 | 131294 | 281275 | 21250 |
| 1997:3 | 248516 | 11228280 | 98.8 | 96 | 225928 | 2101467 | 242308 | 131294 | 281275 | 21250 |
| 1997:4 | 260742 | 11279650 | 100.3 | 94.5 | 228695 | 1781073 | 203662 | 131294 | 281275 | 21250 |
| 1998:1 | 250314 | 11292940 | 102.7 | 94.2 | 231462 | 1500000 | 692000 | 114000 | 275000 | 105750 |
| 1998:2 | 244956 | 11323040 | 103.5 | 94.4 | 234631 | 1619000 | 260000 | 114000 | 275000 | 101750 |
| 1998:3 | 248030 | 11367020 | 103.5 | 95.6 | 237799 | 1771000 | 714000 | 114000 | 275000 | 86750 |
| 1998:4 | 264252 | 11410050 | 103.8 | 97.2 | 240968 | 1242000 | 363000 | 114000 | 275000 | 114750 |
| 1999:1 | 253413 | 11420960 | 104.1 | 98.3 | 244136 | 2085250 | 319000 | 141000 | 201000 | 122750 |
| 1999:2 | 246266 | 11454340 | 104.5 | 99 | 249371 | 1430250 | 354000 | 141000 | 201000 | 155750 |
| 1999:3 | 251642 | 11506360 | 104.5 | 98.5 | 254607 | 1669250 | 410000 | 141000 | 201000 | 113750 |
| 1999:4 | 262343 | 11561190 | 104.6 | 97.5 | 259842 | 1792250 | 170000 | 141000 | 201000 | 128750 |
| 2000:1 | 254451 | 11578840 | 107.7 | 96.8 | 265077 | 1868750 | 254000 | 155000 | 187500 | 128750 |
| 2000:2 | 253455 | 11623230 | 109.6 | 97.9 | 267154 | 1804750 | 463000 | 144000 | 187500 | 102750 |
| 2000:3 | 246861 | 11685380 | 109.6 | 98.2 | 269230 | 1244750 | 661000 | 144000 | 187500 | 149750 |
| 2000:4 | 259666 | 11750560 | 110.3 | 97.8 | 271307 | 1516750 | 452000 | 144000 | 187500 | 139750 |
| 2001:1 | 254874 | 11774290 | 113.1 | 97.6 | 273383 | 2156500 | 183000 | 159000 | 185750 | 122750 |
| 2001:2 | 245854 | 11828340 | 114.5 | 98.3 | 276687 | 2036500 | 330000 | 159000 | 185750 | 121750 |
| 2001:3 | 244929 | 11897650 | 114.4 | 99.3 | 279991 | 1929500 | 702000 | 159000 | 185750 | 101750 |
| 2001:4 | 258847 | 11965420 | 114.3 | 97.5 | 283294 | 1367500 | 763000 | 159000 | 185750 | 101750 |
| 2002:1 | 250232 | 11986890 | 117.2 | 97.3 | 286598 | 1917000 | 867000 | 204000 | 180500 | 122750 |
| 2002:2 | 249560 | 12036970 | 119.1 | 99 | 288331 | 2717000 | 120000 | 204000 | 180500 | 106750 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2002:3 | 245253 | 12102040 | 118.4 | 99.7 | 290063 | 1612000 | 200000 | 234000 | 180500 | 124750 |
| 2002:4 | 265268 | 12153170 | 118.5 | 99 | 291796 | 1912000 | 266000 | 265000 | 180500 | 137750 |
| 2003:1 | 255670 | 12167360 | 121.7 | 99.1 | 293528 | 1716000 | 802000 | 279000 | 220000 | 100750 |
| 2003:2 | 260772 | 12206870 | 122.8 | 99.8 | 305807 | 1355000 | 742000 | 279000 | 220000 | 80750 |
| 2003:3 | 248427 | 12256640 | 123.1 | 100.8 | 310102 | 1915000 | 589000 | 194000 | 220000 | 103750 |
| 2003:4 | 258141 | 12299510 | 123.0 | 98.6 | 314476 | 2644000 | 593000 | 305000 | 220000 | 140750 |
| 2004:1 | 255650 | 12312420 | 126.0 | 99.3 | 318929 | 2486250 | 463000 | 228000 | 172000 | 119750 |
| 2004:2 | 249943 | 12347470 | 127.5 | 98.9 | 323461 | 2169250 | 452000 | 325000 | 172000 | 120750 |
| 2004:3 | 246655 | 12392720 | 127.5 | 100.5 | 328073 | 1220250 | 716000 | 618000 | 172000 | 115750 |
| 2004:4 | 266311 | 12439760 | 127.3 | 99.9 | 332763 | 2095250 | 451000 | 374000 | 172000 | 124750 |

## Appendix IV Marginal rate of return results by quarters

**Maritimes - $10,000/quarter increase in advertising**

| Date | BASE | SCEN10 | MROR |
|---|---|---|---|
| 2000:1 | 57,168 | 57,182 | 0.35 |
| 2000:2 | 55,368 | 55,389 | 0.52 |
| 2000:3 | 55,676 | 55,722 | 1.12 |
| 2000:4 | 58,229 | 58,240 | 0.29 |
| 2001:1 | 56,276 | 56,304 | 0.70 |
| 2001:2 | 54,265 | 54,295 | 0.75 |
| 2001:3 | 54,909 | 54,953 | 1.12 |
| 2001:4 | 57,348 | 57,364 | 0.41 |
| 2002:1 | 55,971 | 55,989 | 0.48 |
| 2002:2 | 54,237 | 54,260 | 0.60 |
| 2002:3 | 54,759 | 54,800 | 1.06 |
| 2002:4 | 56,522 | 56,547 | 0.66 |
| 2003:1 | 55,303 | 55,327 | 0.67 |
| 2003:2 | 54,502 | 54,522 | 0.54 |
| 2003:3 | 55,439 | 55,463 | 0.67 |
| 2003:4 | 57,004 | 57,023 | 0.52 |
| 2004:1 | 55,245 | 55,279 | 1.06 |
| 2004:2 | 54,531 | 54,549 | 0.56 |
| 2004:3 | 55,457 | 55,475 | 0.57 |
| Average | 55,695 | 55,720 | 0.67 |

**Maritimes - $10,000/quarter increase in non-advertising marketing elements**

| Date | BASE | SCEN10 | MROR |
|---|---|---|---|
| 2000:1 | 57,168 | 57,216 | 1.17 |
| 2000:2 | 55,368 | 55,401 | 0.82 |
| 2000:3 | 55,676 | 55,690 | 0.34 |
| 2000:4 | 58,229 | 58,256 | 0.68 |
| 2001:1 | 56,276 | 56,323 | 1.19 |
| 2001:2 | 54,265 | 54,319 | 1.34 |
| 2001:3 | 54,909 | 54,931 | 0.57 |
| 2001:4 | 57,348 | 57,393 | 1.12 |
| 2002:1 | 55,971 | 56,048 | 2.02 |
| 2002:2 | 54,237 | 54,291 | 1.41 |
| 2002:3 | 54,759 | 54,782 | 0.59 |
| 2002:4 | 56,522 | 56,557 | 0.92 |
| 2003:1 | 55,303 | 55,401 | 2.75 |
| 2003:2 | 54,502 | 54,535 | 0.91 |
| 2003:3 | 55,439 | 55,454 | 0.42 |
| 2003:4 | 57,004 | 57,038 | 0.95 |
| 2004:1 | 55,245 | 55,292 | 1.44 |
| 2004:2 | 54,531 | 54,554 | 0.71 |
| 2004:3 | 55,457 | 55,467 | 0.33 |
| Average | 55,695 | 55,734 | 1.05 |

**Ontario - $10,000/quarter increase in advertising**

| Date | BASE | SCEN10 | MROR |
|---|---|---|---|
| 2000:1 | 254,618 | 254,663 | 1.10 |
| 2000:2 | 250,231 | 250,272 | 1.01 |
| 2000:3 | 248,363 | 248,405 | 1.02 |
| 2000:4 | 260,245 | 260,285 | 0.98 |
| 2001:1 | 252,569 | 252,607 | 0.94 |
| 2001:2 | 247,454 | 247,496 | 1.05 |
| 2001:3 | 247,035 | 247,082 | 1.15 |
| 2001:4 | 260,587 | 260,633 | 1.14 |
| 2002:1 | 254,369 | 254,406 | 0.96 |
| 2002:2 | 250,301 | 250,335 | 0.87 |
| 2002:3 | 248,201 | 248,240 | 1.01 |
| 2002:4 | 260,178 | 260,221 | 1.12 |
| 2003:1 | 252,301 | 252,338 | 1.04 |
| 2003:2 | 251,548 | 251,582 | 0.94 |
| 2003:3 | 249,911 | 249,946 | 0.99 |
| 2003:4 | 261,121 | 261,162 | 1.14 |
| 2004:1 | 254,607 | 254,650 | 1.26 |
| 2004:2 | 250,304 | 250,347 | 1.27 |
| 2004:3 | 251,478 | 251,515 | 1.11 |
| 2004.4 | 265,160 | 265,191 | 0.92 |
| Average | 253,529 | 253,569 | 1.05 |

**Ontario - $10,000/quarter increase in non-advertising marketing elements**

| Date | BASE | SCEN10 | MROR |
|---|---|---|---|
| 2000:1 | 254,618 | 254,657 | 0.96 |
| 2000:2 | 250,231 | 250,272 | 1.00 |
| 2000:3 | 248,363 | 248,406 | 1.05 |
| 2000:4 | 260,245 | 260,292 | 1.15 |
| 2001:1 | 252,569 | 252,615 | 1.14 |
| 2001:2 | 247,454 | 247,495 | 1.03 |
| 2001:3 | 247,035 | 247,072 | 0.91 |
| 2001:4 | 260,587 | 260,627 | 0.99 |
| 2002:1 | 254,369 | 254,411 | 1.09 |
| 2002:2 | 250,301 | 250,343 | 1.09 |
| 2002:3 | 248,201 | 248,239 | 0.98 |
| 2002:4 | 260,178 | 260,210 | 0.84 |
| 2003:1 | 252,301 | 252,334 | 0.93 |
| 2003:2 | 251,548 | 251,587 | 1.09 |
| 2003:3 | 249,911 | 249,954 | 1.21 |
| 2003:4 | 261,121 | 261,165 | 1.22 |
| 2004:1 | 254,607 | 254,642 | 1.01 |
| 2004:2 | 250,304 | 250,333 | 0.86 |
| 2004:3 | 251,478 | 251,505 | 0.81 |
| 2004.4 | 265,160 | 265,191 | 0.92 |
| Average | 253,529 | 253,567 | 1.02 |

**Quebec - $10,000/quarter increase in advertising**

| Date | BASE | SCEN10 | ROR |
|---|---|---|---|
| 2000:1 | 162,535 | 162,740 | 5.03 |
| 2000:2 | 156,111 | 156,303 | 4.73 |
| 2000:3 | 154,861 | 155,049 | 4.62 |
| 2000:4 | 166,364 | 166,546 | 4.47 |
| 2001:1 | 160,096 | 160,276 | 4.47 |
| 2001:2 | 154,084 | 154,256 | 4.30 |
| 2001:3 | 153,236 | 153,405 | 4.21 |
| 2001:4 | 165,736 | 165,898 | 4.06 |
| 2002:1 | 159,653 | 159,811 | 4.10 |
| 2002:2 | 153,196 | 153,346 | 3.90 |
| 2002:3 | 152,688 | 152,836 | 3.85 |
| 2002:4 | 163,571 | 163,716 | 3.79 |
| 2003:1 | 158,037 | 158,180 | 4.02 |
| 2003:2 | 151,910 | 152,057 | 4.12 |
| 2003:3 | 150,915 | 151,065 | 4.22 |
| 2003:4 | 163,683 | 163,835 | 4.28 |
| 2004:1 | 158,614 | 158,761 | 4.52 |
| 2004:2 | 151,262 | 151,511 | 7.66 |
| 2004:3 | 149,696 | 149,975 | 8.60 |
| 2004.4 | 158,667 | 159,099 | 13.31 |
| Average | 157,246 | 157,433 | 5.04 |

**Quebec - $10,000/quarter increase in non-advertising marketing elements**

| Date | BASE | SCEN10 | ROR |
|---|---|---|---|
| 2000:1 | 162,535 | 162,679 | 3.53 |
| 2000:2 | 156,111 | 156,180 | 1.70 |
| 2000:3 | 154,861 | 154,913 | 1.27 |
| 2000:4 | 166,364 | 166,511 | 3.61 |
| 2001:1 | 160,096 | 160,289 | 4.81 |
| 2001:2 | 154,084 | 154,178 | 2.33 |
| 2001:3 | 153,236 | 153,306 | 1.74 |
| 2001:4 | 165,736 | 165,935 | 4.98 |
| 2002:1 | 159,653 | 159,867 | 5.57 |
| 2002:2 | 153,196 | 153,299 | 2.69 |
| 2002:3 | 152,688 | 152,765 | 2.02 |
| 2002:4 | 163,571 | 163,789 | 5.71 |
| 2003:1 | 158,037 | 158,266 | 6.43 |
| 2003:2 | 151,910 | 152,021 | 3.11 |
| 2003:3 | 150,915 | 150,998 | 2.33 |
| 2003:4 | 163,683 | 163,920 | 6.66 |
| 2004:1 | 158,614 | 158,860 | 7.57 |
| 2004:2 | 151,262 | 151,380 | 3.64 |
| 2004:3 | 149,696 | 149,784 | 2.71 |
| 2004.4 | 158,667 | 158,913 | 7.57 |
| Average | 157,246 | 157,393 | 3.95 |

**Appendix V**

**Estimated marginal benefit-cost ratios for generic advertising and promotion programs for various food commodities.**

| Commodity | Study | Benefit-Cost Ratio |
|---|---|---|
| U.S. egg advertising | Kaiser and Schmit (2000) | 1.8 to 6.7 |
| U.S. cotton promotion | Crawford, et al. (2001) | 44.5 |
| U.S. pear promotion | Erikson, Mittelhammer & Schotzko (2001) | 3.4 to 18.4 |
| ID-OR onion promotion | Gopinath and Cornelius (2000) | 1.0 to 1.1 |
| Vidalia onion promotion | Costa et al. (2001) | 22.5 |
| Almond export promotion | Halliburton and Henneberry (1995) | 4.95 (Japan) 5.94 (Taiwan) 3.69 (H. Kong) |
| CA tree fruit promotion | Freed, Landry & Associates (1998) | 0.7 to 4.1 |
| OR hazelnut promotion | Gopinath (2001) | 26.0 |
| Australian wool export promotion to U.S. | Dewbre, Richardson, & Beare (1997) | 2.0 |
| Almond domestic promotion | Crespi and Sexton (2001) | 3.0 to 10.0 |
| Raisin export promotion UK and Japan | Kaiser, Liu, and Consignado (2003) | 0.42 (Japan) 3.19 (UK) |
| California egg advertising | Schmit, Reberte, & Kaiser (1997) | 6.9 |
| Prune promotion | Alston et al. (1998) | 2.65 |
| Table grape domestic promotion | Alston et al. (1996) | 80.0 |

**Appendix VI**

**Estimated average benefit-cost ratios for generic advertising and promotion programs for various food commodities.**

| Commodity | Study | Benefit-Cost Ratio |
|---|---|---|
| U.S. dairy advertising | Kaiser (1997) | 3.4 |
| U.S. beef advertising | Ward (1998) | 4.9 to 6.7 |
| U.S. cotton promotion | Nichols et al. (1997) | 3.2 to 3.5 |
| U.S. pork advertising | Davis et al. (2001) | 4.8 to 26.2 |
| U.S. red meat export promotion To Pacific Rim (excluding Japan) | Le, Kaiser, and Tomek (1998) | 15.62 |
| Hawaii papaya promotion | Ferguson, Nakamoto & Sawada (2001) | 0.1 to 31.2 |
| U.S. soybean export promotion & production research | Williams et al. (1998) | 8.3 |
| Canadian butter advertising | Goddard and Amuah (1989) | 1.0 |
| FL orange juice advertising | Capps et al. (2003) | 2.9 to 6.1 |
| FL tomato promotion | Van Sickle and Evans (2001) | 27.2 to 30.9 |
| Pecan export promotion | Onunkwo and Epperson (2000) | 6.45 (Asia)<br>6.75 (EU) |
| CA walnut export promotion | Weiss, Green, & Havenner (1996) | 6.0 |
| Washington apple advertising | Ward and Forker (1991) | 7.0 |
| Walnut domestic promotion | Kaiser (2002) | 1.65 to 9.72 |
| Raisin export promotion | Kaiser, Liu, and Consignado (2003) | 7.32 |
| Pistachio marketing order producers) | Alston et al. (2004) | 13.5 (domestic<br>6.9 (US)<br>6.7 (world) |
| Table grape export promotion | Alston et al. (1996) | 8.0 |